harman/kardon®

AVR 1600

AUDIO/VIDEO RECEIVER
OWNER'S MANUAL

IMPORTANT SAFETY INSTRUCTIONS

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. The A/V receiver's cabinet may be cleaned by gently wiping with a soft cotton or microfiber cloth. Do not use water or any liquid cleaners.
7. Do not block any of the ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. When the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles and the point where they exit from the apparatus.
11. Only use the attachments/accessories specified by the manufacturer.
12. Use only with a cart, stand, tripod, bracket or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

Wet Location Marking

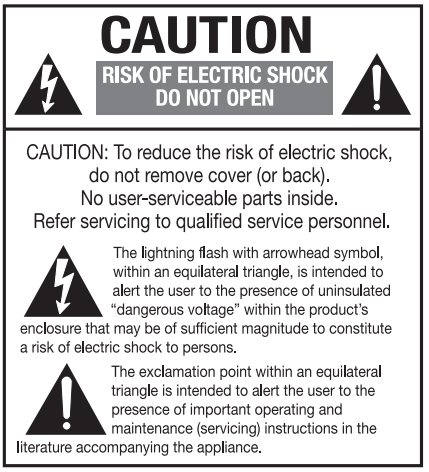
Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.

Service Instructions

CAUTION – These servicing instructions are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions, unless you are qualified to do so.

Outdoor Use Marking

WARNING – To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.


CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
CAUTION: To reduce the risk of electric shock,
do not remove cover (or back).
No user-serviceable parts inside.
Refer servicing to qualified service personnel.
The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.
The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

IMPORTANT SAFETY INFORMATION

Verify Line Voltage Before Use

Your AVR 1600 has been designed for use with 120-volt AC current. Connection to a line voltage other than that for which it is intended can create a safety and fire hazard and may damage the unit.

If you have any questions about the voltage requirements for your specific model, or about the line voltage in your area, contact your selling dealer before plugging the unit into a wall outlet.

Do Not Use Extension Cords

To avoid safety hazards, use only the power cord attached to your unit. We do not recommend that extension cords be used with this product. As with all electrical devices, do not run power cords under rugs or carpets or place heavy objects on them. Damaged power cords should be replaced immediately by an authorized service center with a cord meeting factory specifications.

Handle the AC Power Cord Gently

When disconnecting the power cord from an AC outlet, always pull the plug; never pull the cord. If you do not intend to use the unit for any considerable length of time, disconnect the plug from the AC outlet.

Do Not Open the Cabinet

There are no user-serviceable components inside this product. Opening the cabinet may present a shock hazard, and any modification to the product will void your warranty. If water or any metal object such as a paper clip, wire or staple accidentally falls inside the unit, disconnect it from the AC power source immediately, and consult an authorized service center.

CATV or Antenna Grounding

If an outside antenna or cable system is connected to this product, be certain that it is grounded so as to provide some protection against voltage surges and static charges. Section 810 of the National Electrical Code, ANSI/NFPA No. 70-1984, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes and requirements of the grounding electrode.

NOTE TO CATV SYSTEM INSTALLER: This reminder is provided to call the CATV (cable TV) system installer's attention to article 820-40 of the NEC, which provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as possible.

Installation Location

- To ensure proper operation and to avoid the potential for safety hazards, place the unit on a firm and level surface. When placing the unit on a shelf, be certain that the shelf and any mounting hardware can support the weight of the product.
- Make certain that proper space is provided both above and below the unit for ventilation. If this product will be installed in a cabinet or other enclosed area, make certain that there is sufficient air movement within the cabinet. Under some circumstances, a fan may be required.
- Do not place the unit directly on a carpeted surface.
- Avoid installation in extremely hot or cold locations, or in an area that is exposed to direct sunlight or heating equipment.
- Avoid moist or humid locations.
- Do not obstruct the ventilation slots on the top of the unit, or place objects directly over them.
- Due to the weight of the AVR 1600 and the heat generated by the amplifiers, there is the remote possibility that the rubber padding on the bottom of the unit's feet may leave marks on certain wood or veneer materials. Use caution when placing the unit on soft woods or other materials that may be damaged by heat or heavy objects. Some surface finishes may be particularly sensitive to absorbing such marks, due to a variety of factors beyond our control, including the nature of the finish, cleaning materials used, and normal heat and vibration caused by the use of the product, or other factors. We recommend that caution be exercised in choosing an installation location for the component and in normal maintenance practices, as your warranty will not cover this type of damage to furniture.

Cleaning

When the unit gets dirty, wipe it with a clean, soft, dry cloth. If necessary, and only after unplugging the AC power cord, wipe it with a soft cloth dampened with mild soapy water, then a fresh cloth with clean water. Wipe it dry immediately with a dry cloth. NEVER use benzene, aerosol cleaners, thinner, alcohol or any other volatile cleaning agent. Do not use abrasive cleaners, as they may damage the finish of metal parts. Avoid spraying insecticide near the unit.

Moving the Unit

Before moving the unit, be certain to disconnect any interconnection cords with other components, and make certain that you disconnect the unit from the AC outlet.

Important Information for the User

This equipment has been tested and found to comply with the limits for a Class-B digital device, pursuant to Part 15 of the FCC Rules. The limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio-frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that harmful interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept interference received, including interference that may cause undesired operation.

NOTE: Changes or modifications may cause this unit to fail to comply with Part 15 of the FCC Rules and may void the user's authority to operate the equipment.

UNPACKING

The carton and shipping materials used to protect your new receiver during shipment were specially designed to cushion it from shock and vibration. We suggest that you save the carton and packing materials for use in shipping if you move, or should the unit ever need repair.

To minimize the size of the carton in storage, you may wish to flatten it. This is done by carefully slitting the tape seams on the bottom and collapsing the carton. Other cardboard inserts may be stored in the same manner. Packing materials that cannot be collapsed should be saved along with the carton in a plastic bag.

If you do not wish to save the packaging materials, please note that the carton and other sections of the shipping protection are recyclable. Please respect the environment and discard those materials at a local recycling center.

It is important that you remove the protective plastic film from the front-panel lens. Leaving the film in place will affect the performance of your remote control.

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WARNING

To prevent fire or shock hazard, do not expose this appliance to rain or moisture.

For Canadian model

This Class B digital apparatus complies with Canadian ICES-003. For models having a power cord with a polarized plug:

CAUTION: To prevent electric shock, match wide blade of plug to wide slot, fully insert.

Modèle pour les Canadien

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada. Sur les modèles dont la fiche est polarisee:

ATTENTION: Pour éviter les chocs électriques, introduire la lame la plus large de la fiche dans la borne correspondante de la prise et pousser jusqu'au fond.

Please register your AVR 1600 at www.harmankardon.com.

NOTE: You'll need the product's serial number. At the same time, you can choose to be notified about new products and/or special promotions.

Thank you for choosing a Harman Kardon® product!

For more than fifty years, the Harman Kardon® mission has been to share a passion for music and entertainment, using leading-edge technology to achieve premium performance. Harman Kardon, Inc., invented the receiver, a single component designed to simplify home entertainment without compromising performance. Over the years, Harman Kardon products have become easier to use, while offering more features and sounding better than ever. The AVR 1600 7.1-channel digital audio/video receiver continues this tradition with some of the most advanced audio and video processing capabilities in its class, and a wealth of listening and viewing options.

To obtain the maximum enjoyment from your new receiver, please read this manual and refer back to it as you become more familiar with its features and their operation.

If you have any questions about this product, its installation or its operation, please contact your Harman Kardon retailer or custom installer, or visit the Web site at www.harmankardon.com.

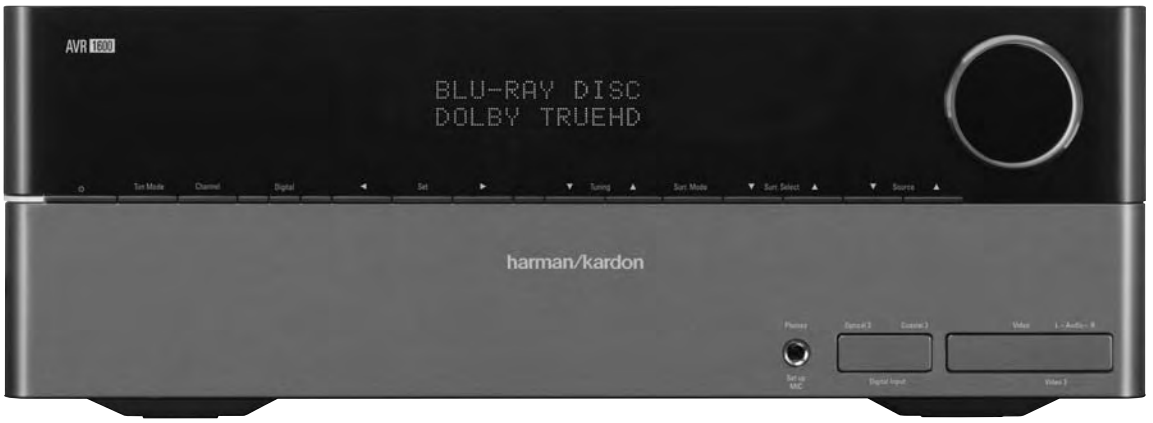
Harman Kardon AVR 1600 7.1-Channel Audio/Video Receiver

Audio Section

- 35 Watts x 7, seven channels driven at full power at 8 ohms, 20Hz – 20kHz, <0.07% THD, 245 watts total
- High-current capability, ultrawide-bandwidth amplifier design with low negative feedback
- All-discrete amplifier circuitry
- Quadruple-crossover bass management
- 24-bit, twin-core Cirrus Logic® CS 497024 DSP processor
- 192kHz/24-bit A/D and D/A conversion
- Sampling upconversion to 96kHz

Surround Modes

- Dolby Digital EX, Dolby Digital Plus, Dolby TrueHD
- Dolby Pro Logic® II and IIx (Movie, Music and Game), up to 96kHz
- Harman Virtual Speaker
- Harman Headphone
- DTS-HD High Resolution Audio™, DTS-HD Master Audio™
- DTS® (5.1; DTS Stereo; DTS-ES® 6.1 Discrete and Matrix)
- DTS 96/24™ (DTS Stereo)
- DTS Neo:6® (Cinema 5-, 6- or 7-channel; Music 5-, 6- or 7-channel), up to 96kHz
- Logic 7® (Movie, Music and Game), up to 96kHz
- 5- or 7-Channel Stereo, up to 96kHz
- Surround Off (DSP or Analog Bypass)



Audio Inputs

- AM/FM tuner
- CD
- Tape
- Front-panel Analog Audio
- 6-/8-Channel Analog Audio
- Auxiliary mini-jack

Audio/Video Inputs

- Three Analog Video
- Front-panel Analog Video
- Two Component Video 100MHz
- Three HDMI™ (V.1.3a with Deep Color)
- Transcodes component video to HDMI output, preserving native resolution
- Simultaneous output of component video sources through component video and HDMI outputs

Digital Audio Inputs

- Coaxial: two rear-panel/one front-panel
- Optical: two rear-panel/one front-panel

Outputs

- Subwoofer output
- Two Analog Audio
- One Analog Video
- Video Monitor (composite and component)
- Digital Audio (one coaxial)
- HDMI (V.1.3a with Deep Color)
- Headphone

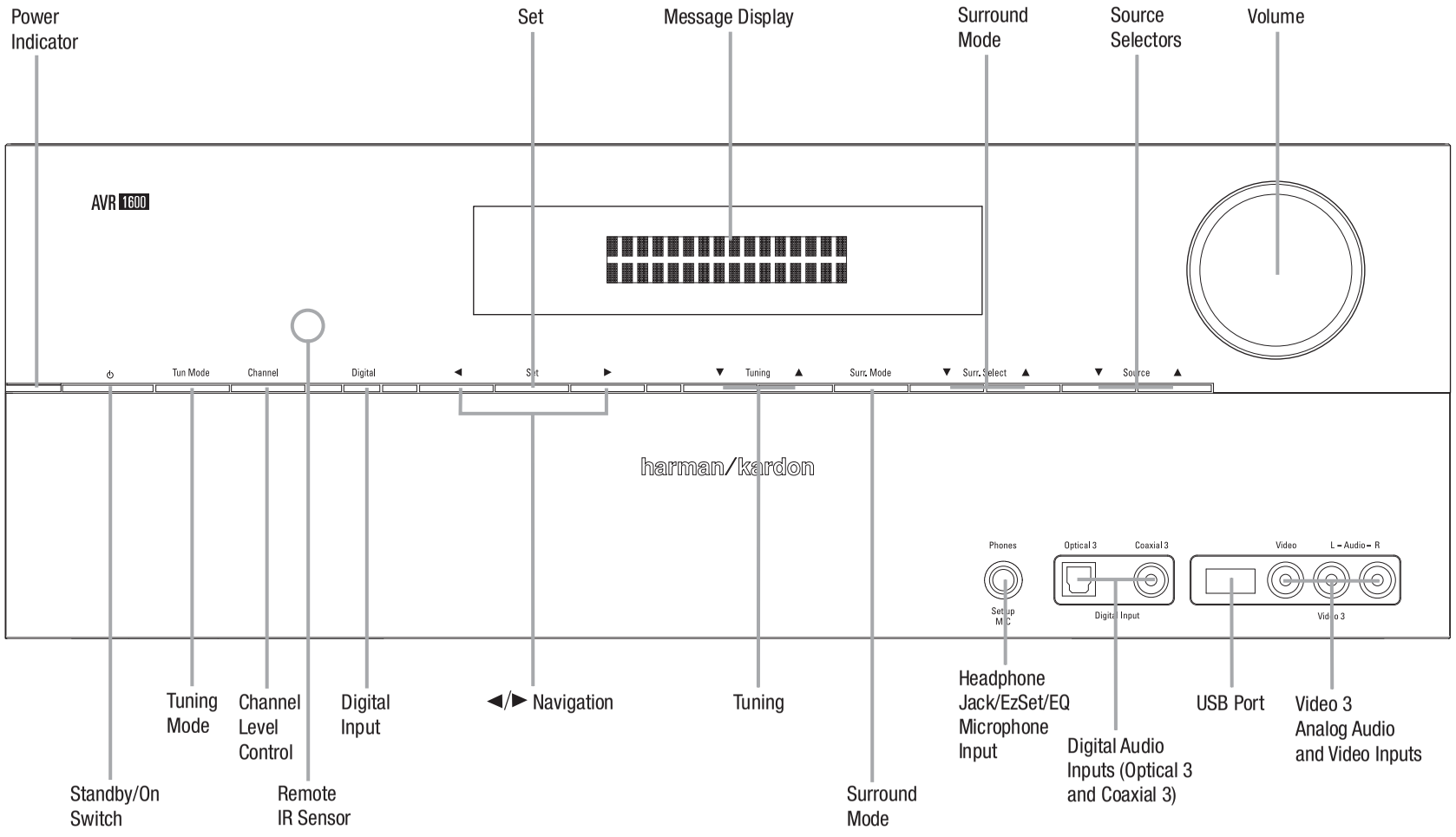
Ease of Use

- EzSet/EQ™ automated setup (microphone supplied)
- Text-based on-screen menu system available at composite video and HDMI outputs (480i only)
- Two-line dot-matrix front-panel display
- Color-coded connections
- Programmable, eleven-device main remote control
- Source input renaming
- Lip Sync Delay (up to 180msec)
- USB port for system upgrades

Supplied Accessories

The following accessory items are supplied with the AVR 1600. If any of these items are missing, please contact Harman Kardon customer service at www.harmankardon.com.

- System remote control
- EzSet/EQ microphone
- AM loop antenna
- FM wire antenna
- Three AAA batteries
- Two covers for front-panel jacks



NOTE: To make it easier to follow the instructions throughout the manual that refer to this illustration, a copy of this page may be downloaded from the Product Support section at www.harmankardon.com.

Power Indicator: This LED has three possible modes:

- **Main Power Off:** When the AVR is unplugged or the rear-panel Main Power Switch is off, this LED is off.
- **Standby:** Amber indicates that the AVR is ready to be turned on.
- **On:** When the AVR is turned on, this LED turns white.

NOTE: If the PROTECT message ever appears, turn off the AVR and unplug it. Check all speaker wires for a possible short. If none is found, bring the unit to an authorized Harman Kardon service center for inspection and repair before using it again.

Standby/On Switch: This electrical switch turns the receiver on, or places it in Standby mode for quick turn-on.

Tuning Mode: This button toggles between manual (one frequency step at a time) and automatic (seeks frequencies with acceptable signal strength) tuning mode. It also toggles between stereo and mono modes when an FM station is tuned.

Channel Level Control: Press this button to adjust the output level for any amplifier channel. It may be necessary to raise or lower the level of a specific channel to compensate for the placement of the relevant speaker in the room in relation to the listening position, e.g. the center channel speaker is further away from the listening position than the front left and right speakers, so that the dialogue is too soft to hear clearly.

To adjust the level of a channel, press this button once. If the desired channel is not displayed on screen and in the front-panel Message Display, use the Tuning Buttons to scroll to it. When the desired channel appears, use the ◄/► Navigation Buttons to change the level.

It is recommended that you avoid changing the channel levels after you have run the EzSet/EQ setup procedure described in the Initial Setup section, which properly adjusts all channel levels. See the Advanced Functions section for more information on manual speaker setup, including level adjustment.

Remote IR Sensor: This sensor receives infrared (IR) commands from the remote control. It is important to ensure that it is not blocked. If covering the sensor is unavoidable, use an optional Harman Kardon HE 1000, or other infrared receiver, connecting it to the Remote IR Input on the AVR 1600's rear panel.

Digital Input: To change the audio input for the current source to one of the six digital audio inputs or the analog input for the source, press this button and use the ◄/► Navigation Buttons to change the input. Although any digital audio input may be assigned to any source, the analog audio inputs are all permanently dedicated to the source with which they are labeled.

◄/► Navigation: These buttons are used to navigate the AVR's menus.

Set: Press this button to select the currently highlighted item.

Message Display: Various messages appear in this two-line display in response to commands and changes in the incoming signal. In normal operation, the current source name appears on the upper line, while the surround mode is displayed on the lower line. When the on-screen display menu system (OSD) is in use, the current menu settings appear.

Tuning: Press these buttons to tune a radio station.

Surround Modes: Press this button to select a surround sound (e.g., multichannel) mode. Each press changes the surround mode category: AUTO SELECT, VIRTUAL, STEREO, MOVIE, MUSIC, VIDEO GAME. To change the specific mode within the category, use the Surround Select Buttons. See the Advanced Functions section for more information on surround modes.

Surround Select: After you have selected the desired surround mode category, press these buttons to select a specific mode within the category, such as to change from Dolby Pro Logic IIx Movie mode to Logic 7 Movie mode. Surround mode availability depends on the nature of the source input signal, i.e. digital versus analog, and number of channels encoded within the signal.

Source Selectors: Press these buttons to select a source device, which is a component where a playback signal originates, e.g., DVD.

Headphone Jack/EzSet/EQ Microphone Input: Plug a 1/4" headphone plug into this jack for private listening.

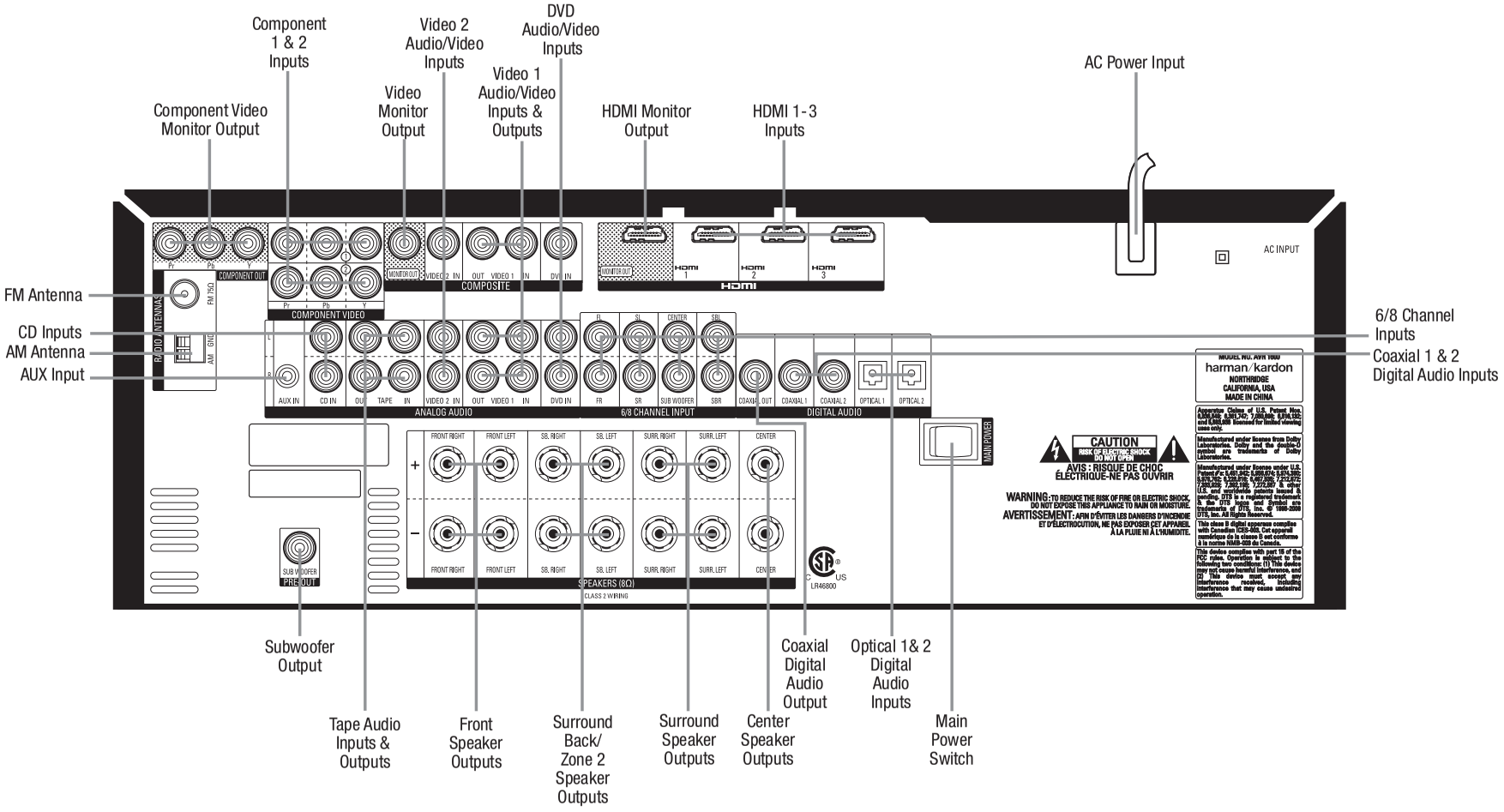
This jack is also used to connect the supplied microphone for the EzSet/EQ procedure described in the Initial Setup section.

Digital Audio Inputs (Optical 3 and Coaxial 3): Connect a source component that will only be used temporarily, such as a digital camera or game console, to these jacks. Use only one type of audio. The audio input may be assigned to any video source.

USB Port: This port may be used in case a software upgrade for the receiver is offered in the future. Do not connect a storage device, peripheral product or a PC here, unless instructed to do so as part of an upgrade procedure.

Video 3 Analog Audio and Video Inputs: Connect a source component that will only be used temporarily, such as a digital camera or game console, to these jacks. These inputs are selected as the Video 3 source, and may not be assigned to other sources.

Volume Knob: Turn this knob to raise or lower the volume.



NOTE: To make it easier to follow the instructions throughout the manual that refer to this illustration, a copy of this page may be downloaded from the Product Support section at www.harmankardon.com.

AM and FM Antenna Terminals: Connect the included AM and FM antennas to their respective terminals for radio reception.

Component Video Monitor Output: If you are using one of the Component Video Inputs and your television or video display is component-video-capable, connect these jacks to the video display.

NOTE: Due to copy-protection restrictions, there is no output at the Component Video Monitor Outputs for copy-protected sources.

Component Video 1/2 Inputs: If a video source has analog component video (Y/Pb/Pr) capability, and if you are not using an HDMI connection, connect the component video outputs of the source to one of the sets of component video inputs. Do not make any other video connections to that source. These inputs may be assigned to any source.

NOTE: It is not possible to have no component video input assigned to a source, as the AVR 1600 does not transcode composite video source signals to the component video format. Thus, if a signal is present at the input assigned to the source, and you have connected the source device to the composite video input, you will not see the correct picture unless you turn off the component connected to the component video input, or assign the other component video input to the source.

Video Monitor Output: If any of your sources use composite video connections, connect this monitor output to the corresponding input on your video display. Composite video source signals are only available at this output.

Video 1, Video 2 and DVD Audio/Video Inputs: These jacks may be used to connect your video-capable source components (e.g., Blu-ray Disc™ player, DVD player, cable TV box) to the receiver.

NOTE: If a source is equipped with an HDMI output, it is preferable to connect it to one of the AVR's HDMI Inputs. If the source does not have an HDMI output, use its component or composite video output, and make a separate audio connection.

Video 1 Audio/Video Outputs: These jacks may be used to connect your DVR, VCR or another recorder.

HDMI Inputs and Output: HDMI (High-Definition Multimedia Interface) is a connection for transmitting digital audio and video signals between devices. Connect up to three HDMI-equipped source devices to the HDMI inputs using a single-cable connection.

When you connect the HDMI Output to your video display, the AVR 1600 will automatically transcode component video source signals to the HDMI format, but they will be passed through at the original resolution and will not be scaled. The AVR's on-screen menus are visible when the HDMI Output is used, but only at 480i resolution. The main video source will not be visible.

NOTES: When connecting a DVI-equipped display to one of the HDMI Outputs:

- Use an HDMI-to-DVI adapter.
- Make sure the display is HDCP-compliant. If it isn't, do not connect it to an HDMI Output; use an analog video connection instead.
- Always make a separate audio connection.

AC Power Cord: After you have made all other connections, plug the AC power cord into an unswitched wall outlet.

Main Power Switch: This mechanical switch turns the power supply on or off. It is usually left on, and cannot be turned on or off using the remote control.

Coaxial 1/2 and Optical 1/2 Digital Audio Inputs: If a source has a compatible digital audio output, and if you are not using an HDMI connection for audio for the device, connect it to one of these jacks to hear digital audio formats, such as Dolby Digital, DTS and linear PCM. Use only one type of digital audio connection for each source.

Coaxial Digital Audio Output: If a source is also an audio recorder, connect the Coaxial Digital Audio Output to the recorder's matching input for improved recording quality. Only PCM digital audio signals are available for recording. Both coaxial and optical digital audio signals are available at this Digital Audio Output.

Front, Center, Surround and Surround Back Speaker Outputs: Use two-conductor speaker wire to connect each set of terminals to the correct speaker. Remember to observe the correct polarity (positive and negative connections).

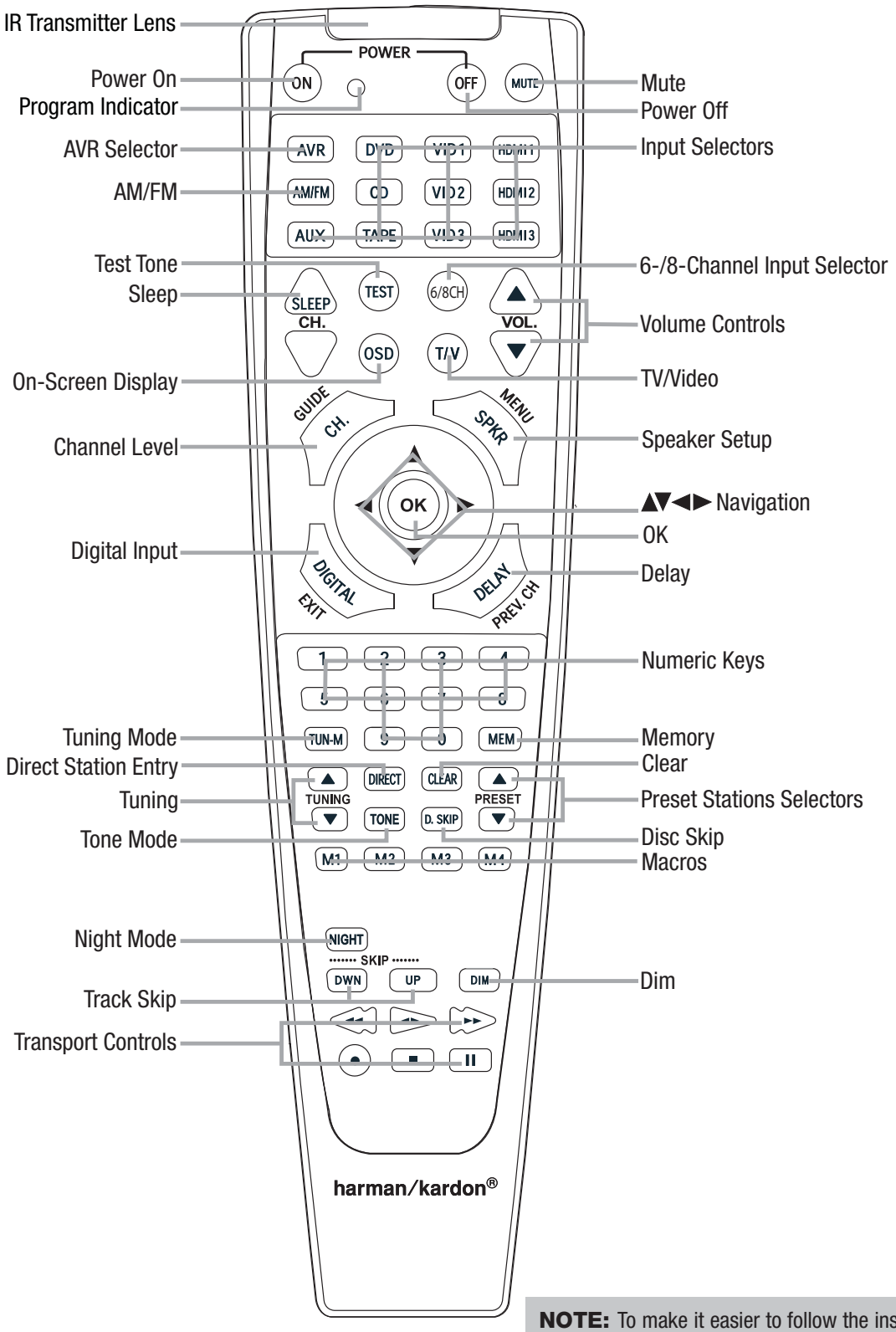
6-/8-Channel Analog Audio Inputs: Connect the multichannel analog audio outputs of a non-HDMI player (DVD-Audio, SACD™, Blu-ray Disc™ or HD-DVD, or any other external decoder) to these jacks. See page 30 for more information.

CD and Tape Audio Inputs: These jacks may be used to connect audio-only source components (e.g., CD player, tape deck). Do not connect a turntable to these jacks unless you are using it with a phono preamp.

Subwoofer Output: If you have a powered subwoofer with a line-level input, connect it to the Subwoofer Output.

AUX Input: Enjoy audio from an iPod (not included), CD player or other portable player by connecting its headphone jack to this input using a 1/8" stereo mini-plug cable (not included). Video and still-image playback are not available at this input.

MAIN REMOTE CONTROL FUNCTIONS



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MAIN REMOTE CONTROL FUNCTIONS

The AVR 1600 remote is capable of controlling up to 11 devices, including the AVR itself and a device connected to the Auxiliary Input. During the installation process, you may program the codes for each of your source components into the remote. Each time you wish to operate any component, or the AVR first press its Selector button to change the device mode to the appropriate codes.

Each Input Selector has been preprogrammed to control certain types of components, with only the codes specific to each brand and model changing, depending on which product code is programmed. The device types programmed into each selector, except the HDMI selectors, may not be changed.

DVD: Controls Harman Kardon Blu-ray Disc players and many brands of DVD players and recorders.

CD: Controls CD players and recorders.

Tape: Controls cassette decks.

Video 1: Controls VCRs, TiVo® devices and DVRs, and the Harman Kardon DMC 1000 digital media center.

Video 2: Controls cable and satellite television set-top boxes.

Video 3: Controls televisions and other video displays.

HDMI 1, 2 and 3: Each code set controls a source device (VCR/PVR/DVD player or cable/satellite set-top box) connected to one of these inputs.

AUX: Controls a device connected to the Auxiliary Input.

Any given button may have different functions, depending on which component is being controlled. Some buttons are labeled with these functions. For example, the Sleep Button is labeled for use as the Channel Up Button when controlling a television or cable box. See Table A8 in the appendix for listings of the different functions for each type of component.

IR Transmitter Lens: As buttons are pressed on the remote, infrared codes are emitted through this lens.

Power On Button: Press this button to turn on the AVR or another device. The Main Power Switch must first have been switched on.

Mute Button: Press to mute the AVR 1600's speaker and headphone outputs. To end the muting, press this button, adjust the volume or turn off the receiver.

Program Indicator: This LED lights up or flashes in one of three colors as the remote is programmed with codes.

Power Off Button: Press to turn off the AVR 1600 or another device.

AVR Selector: Press to switch the remote to AVR device mode.

Input Selectors: Press one of these buttons to select a source device e.g., DVD, CD, cable TV, satellite or HDTV tuner. This will also turn on the receiver and switch the remote's device mode to operate the source.

AM/FM Button: Press this button to select the tuner as the source, or to switch between the AM and FM bands.

6-/8-Channel Input Selector: Press this button to select the 6-/8-Channel Inputs as the audio source. If a signal is present at the component video inputs assigned to this source, it will be used. If not, the receiver will use the video input and remote control codes for the last-selected analog video source.

Test Tone: Press this button to activate the test tone for manual output-level calibration.

TV/Video: This button has no effect on the receiver, but is used to switch video inputs on some video source components.

Sleep Button: Press this button to activate the sleep timer, which turns off the receiver after a programmed period of time of up to 90 minutes.

Volume Controls: Press these buttons to raise or lower the volume, which will be shown in decibels (dB) in the Message Display.

On-Screen Display (OSD): Press this button to activate the on-screen menu system.

Channel Level: Press this button to adjust the output levels for any channel so that all speakers sound equally loud at the listening position.

Speaker Setup: Press this button to configure speaker sizes, that is, the low-frequency capability of each speaker.

Navigation (▲/▼◄/►) and OK Buttons: These buttons are used to make selections within the on-screen menu system, or when accessing the functions of the four buttons surrounding this area of the remote – Channel Level, Speaker Setup, Digital Input or Delay.

Digital Input Select: Press this button to select the specific digital audio input (or analog audio input) to which the current source is connected.

Delay: Press this button to set delay times that compensate for placing the speakers at different distances from the listening position, or to resolve a "lip sync" issue that may be caused by digital video processing.

NOTE: The Channel Level, Speaker Setup, Digital Input Select and Delay functions may also be adjusted using the OSD on-screen menus. In addition, the EzSet/EQ system may be used to adjust the Channel Level, Speaker Setup and Delay settings automatically.

Numeric Keys: Use these buttons to enter radio station frequencies or to select station presets. Press the Direct Button before entering the station frequency.

Tuning Mode: This button toggles between manual (one frequency step at a time) and automatic (seeks frequencies with acceptable signal strength) tuning mode. It also toggles between stereo and mono modes when an FM station is tuned.

Memory: After you have tuned a particular radio station, press this button, then the numeric keys, to save that station as a radio preset.

Tuning: Press these buttons to tune a radio station. Depending on whether the tuning mode has been set to manual or automatic, each press will either change one frequency step at a time, or seek the next frequency with acceptable signal strength.

Direct: Press this button before using the Numeric Keys to directly enter a radio station frequency.

Clear: Press this button to clear a radio station frequency you have started to enter.

Preset Stations Selector: Press these buttons to select a preset radio station.

Tone Mode: Press this button to access the tone controls (bass and treble). Use the Navigation Buttons to make your selections.

Disc Skip: This button has no effect on the receiver, but is used with some optical disc changers to skip to the next disc.

Macros: These buttons may be programmed to execute long command sequences with a single button press. They are useful for programming the command to turn on or off all of your components, or for accessing specialized functions for a different component than you are currently operating.

Night Mode: Press this button to activate Night mode with specially encoded Dolby Digital discs or broadcasts. Night mode compresses the audio so that louder passages are reduced in volume to avoid disturbing others, while dialogue remains intelligible.

Track Skip: These buttons have no effect on the receiver, but are used with many source components to change tracks or chapters.

Dim: Press this button to partially or fully dim the front-panel display.

Transport Controls: These buttons have no effect on the receiver, but are used to control many source components. By default, when the remote is operating the receiver, these buttons will control a DVD player.

This introductory section will help you to familiarize yourself with some basic concepts unique to multichannel surround sound receivers, which will make setup and operation smoother.

Typical Home Theater System

A home theater typically includes an audio/video receiver, which controls the system; a disc player; a source component for television broadcasts (cable box, satellite dish receiver, HDTV tuner or antenna connected to the TV); a video display (television); and loudspeakers.

Multichannel Audio

The main benefit of a home theater system is the placement of loudspeakers around the room to produce "surround sound." Surround sound immerses you in the presentation for increased realism.

The AVR 1600 may have up to seven speakers connected directly to it, plus a subwoofer. Each main speaker is powered by its own amplifier channel inside the receiver. A system with more than two speakers is called a multichannel system.

- **Front Left and Right –** The main speakers are used as in a 2-channel system. In many surround modes, these speakers are secondary, while the main action, especially dialogue, is moved to the center speaker.
- **Center –** The center speaker is used for dialogue in movies and television programs, allowing the dialogue to originate near the actors' faces, for a more natural sound.
- **Surround Left and Right –** The surround speakers improve directionality of ambient sounds. In addition, more loudspeakers play dynamic soundtracks without risk of overloading any one speaker.
- **Surround Back Left and Right –** Additional surround speakers may be placed behind the listening position, improving the precision of ambient sounds and allowing for more realistic pans.

  The surround back speakers are used with surround modes designed for 7.1-channel systems, such as Dolby Digital EX, Dolby Digital Plus, Dolby TrueHD, DTS-ES (Discrete and Matrix), DTS-HD High Resolution Audio, DTS-HD Master Audio and Logic 7 (7.1 modes). The surround back speakers are optional, and the AVR 1600 may be set up with a 5.1-channel system in the main listening area.

  Many people expect the surround speakers to play as loudly as the front speakers. Although all of the speakers in the system will be calibrated to sound equally loud at the listening position, most artists use the surround speakers for ambient effects only, and they program their materials to steer very little sound to these speakers.
- **Subwoofer –** A subwoofer is designed to play only the lowest frequencies (the bass). It augments smaller, limited-range satellite speakers used for the other channels. Many digital-format programs, such as movies recorded in Dolby Digital, contain a low-frequency effects (LFE) channel which is directed to the subwoofer. The LFE channel packs the punch of a rumbling train or airplane, or the power of an explosion, adding realism and excitement to your home theater. Some people use two subwoofers, for additional power and even distribution of the sound.

Surround Modes

There are different theories as to the best way to present surround sound and to distribute information to the speakers. A variety of algorithms have been developed in an effort to reproduce the way we hear sounds in the real world, resulting in a rich variety of options.

Several companies have taken surround sound in different directions:

- **Dolby Laboratories –** Dolby TrueHD, Dolby Digital Plus, Dolby Digital, Dolby Digital EX, Dolby Pro Logic II and IIx, Dolby Virtual Speaker, Dolby Headphone
- **DTS –** DTS-HD High Resolution Audio, DTS-HD Master Audio, DTS, DTS-ES (Discrete and Matrix), DTS Neo:6, DTS 96/24
- **Harman International (the Harman Kardon parent company) –** Logic 7
- **Stereo Modes –** Generic modes that expand upon conventional 2-channel stereo, including 5- and 7-channel stereo

Table A13 in the appendix contains detailed explanations of the mode groups and the mode options available within each group. Digital modes, such as Dolby Digital and DTS, are only available with specially encoded programs, such as HDTV, Blu-ray Disc media and digital cable or satellite television. Other modes may be used with digital and analog signals to create a different surround presentation, or to use a different number of speakers. Surround Mode selection depends upon the number of speakers in your system, the materials you are watching or listening to, and your personal tastes.

There are different types of audio and video connections used to connect the receiver, the speakers, the video display, and the source devices. The Consumer Electronics Association has established the CEA® color-coding standard. Some of these connectors are not used on the AVR 1600, although they may be found on other components in your system. See Table 1.

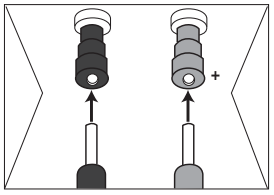
Table 1 – Connection Color Guide

Audio Connections		
	Left	Right
Front **(FL/FR)**	**White**	**Red**
Center **(C)**	**Green**	
Surround **(SL/SR)**	**Blue**	**Gray**
Surround Back **(SBL/SBR)**	**Brown**	**Tan**
Subwoofer **(SUB)**	**Purple**	
Digital Audio Connections		
Coaxial	**Orange**	
Optical	Input	Output
Video Connections		
Component	Y **Green**	Pb **Blue** Pr **Red**
Composite	**Yellow**	
S-Video		
HDMI™ Connections (digital audio/video)		
HDMI		

Speaker Connections

Speaker cables carry an amplified signal from the receiver's speaker terminals to each loudspeaker. They contain two wire conductors, or leads, inside plastic insulation, that are differentiated in some way, such as with colors or stripes.

The differentiation preserves polarity, without which low-frequency performance can suffer. Each speaker is connected to the receiver's speaker-output terminals using two wires, one positive (+) and one negative (–). Always connect the positive terminal on the speaker, which is usually colored red, to the positive terminal on the receiver, which is colored as indicated in the Connection Color Guide (Table 1). The negative terminals are both black.



The AVR 1600 uses binding-post speaker terminals that can accept banana plugs or bare-wire cables. Banana plugs are inserted into the hole in the middle of the terminal cap. See Figure 1.

Figure 1 – Binding-Post Speaker Terminals With Banana Plugs

Bare wire cables are installed as follows (see Figure 2):

1. Unscrew the terminal cap until the pass-through hole is revealed.
2. Insert the bare end of the wire into the hole.
3. Hand-tighten the cap until the wire is held snugly.

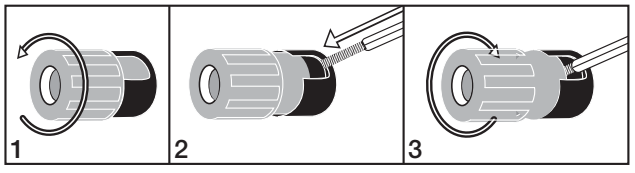


Figure 2 – Binding-Post Speaker Terminals With Bare Wires

Subwoofer

The subwoofer is dedicated to the low frequencies (bass), which require more power. To obtain the best results, most speaker manufacturers offer powered subwoofers that contain their own amplifier. Usually, a line-level (nonamplified) connection is made from the receiver's Subwoofer Output to a corresponding jack on the subwoofer, as shown in Figure 3.

Although the purple subwoofer outputs look similar to full-range analog audio jacks, they are filtered to allow only the low frequencies to pass. Don't connect these outputs to any other devices.

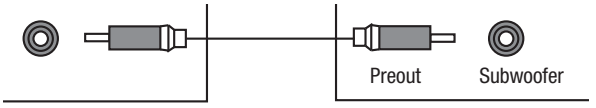


Figure 3 – Subwoofer

CONNECTING SOURCE DEVICES TO THE AVR

Audio and video signals originate in "source devices," including your Blu-ray Disc or DVD player, CD player, DVR (digital video recorder) or other recorder, tape deck, game console, cable or satellite television box or MP3 player. The AVR's tuner also counts as a source, even though no external connections are needed, other than the FM and AM antennas and the SIRIUS tuner module.

Separate connections are required for the audio and video portions of the signal, except for digital HDMI connections. The types of connections used depend upon the capabilities of the source device and video display.

Audio Connections

There are two types of audio connections: digital and analog. Digital audio signals are required for listening to sources encoded with digital surround modes, such as Dolby Digital and DTS, or for noncompressed PCM digital audio. There are three types of digital audio connections: HDMI, coaxial and optical. Do not use more than one type of digital audio connection for each source device. However, it's okay to make both analog and digital audio connections to the same source.

NOTE: HDMI signals may carry both audio and video. If your video display device has an HDMI input, make a single HDMI connection from each source device to the AVR. Usually, a separate digital audio connection is not required. Turn the volume on your television all the way down.

Digital Audio

The AVR 1600 is equipped with three HDMI (High-Definition Multimedia Interface) inputs, and one output. HDMI technology enables digital audio and video information to be carried using a single cable, delivering the highest quality picture and sound.

The AVR 1600 uses HDMI (V.1.3a with Deep Color) technology and is capable of processing both the audio and video components of the HDMI data, minimizing the number of cable connections in your system. The AVR 1600 implements Deep Color, which increases by an order of magnitude the shades of color that can be displayed, and the latest lossless multichannel audio formats, including Dolby TrueHD and DTS-HD Master Audio.

NOTE: Some DVD-Audio, SACD, Blu-ray Disc and HD-DVD players only output multichannel audio through their multichannel analog outputs. Make a separate analog audio connection in addition to the HDMI connection, which is still used for video and to listen to Dolby Digital, DTS or PCM materials that may be stored on the disc.

The AVR 1600 converts analog video signals to the HDMI format, including its on-screen menus, upscaling to high-definition 1080p resolution.

The HDMI connector is shaped for easy plug-in (see Figure 4). If your video display has a DVI input and is HDCP-compliant, use an HDMI-to-DVI adapter (not included). A separate audio connection is required. HDMI cable runs are limited to about 10 feet.

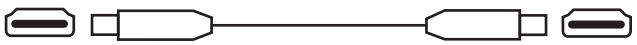


Figure 4 – HDMI Connection

If your video display or source device is not HDMI-capable, use one of the analog video connections (composite or component video) and a separate audio connection.

Coaxial digital audio jacks are usually color-coded in orange. Although they look similar to analog jacks, you should not connect coaxial digital audio outputs to analog inputs or vice versa. See Figure 5.

Figure 5 – Coaxial Digital Audio

Optical digital audio connectors are normally covered by a shutter to protect them from dust. The shutter opens as the cable is inserted. Input connectors are color-coded using a black shutter, while outputs use a gray shutter. See Figure 6.

Figure 6 – Optical Digital Audio

Analog Audio

Analog connections require two cables, one for the left channel (white) and one for the right channel (red). These two cables are often attached to each other. See Figure 7.

For sources that are capable of both digital and analog audio, you may make both connections.

You may only record materials from DVDs or other copy-protected sources using analog connections. Remember to comply with all copyright laws, if you choose to make a copy for your own personal use.

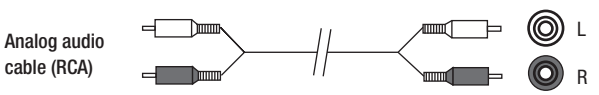


Figure 7 – Analog Audio

The 6-/8-Channel Inputs are multichannel analog connections that are used with high-definition sources that decode the copy-protected digital content, such as some DVD-Audio, SACD, Blu-ray Disc and HD-DVD players. See Figure 8. The multichannel analog audio connection is not required for players compliant with HDMI version 1.1 or better, or that output linear PCM signals via an HDMI connection. Consult the owner's guide for your disc player for more information, and see page 30.

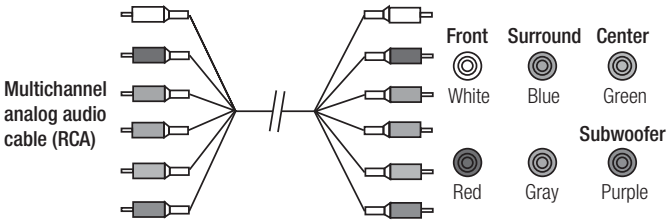


Figure 8 – Multichannel Analog Audio

The AVR 1600 has an Auxiliary Audio Input on the rear panel in the form of a stereo 1/8" mini jack. Connect the headphone output of any audio source, such as an MP3 player or portable CD player, to the Auxiliary Audio Input. See Figure 9.

Figure 9 – Auxiliary Audio Input

Video Connections

Many sources output both audio and video signals (e.g., Blu-ray Disc or DVD player, cable television box, HDTV tuner, satellite box, VCR, DVR). In addition to the audio connection, make one type of video connection for each of these sources (only one at a time for any source).

Digital Video

If you have already connected a source device to one of the HDMI inputs, you have automatically made a video connection, as the HDMI signal includes both digital audio and video components.

Analog Video

There are two types of analog video connections used on the AVR 1600: composite video and component video.

Composite video is the basic connection most commonly available. The jack is usually color-coded yellow, and looks like an analog audio jack. Do not plug a composite video cable into an analog or coaxial digital audio jack, or vice versa. Both the chrominance (color) and luminance (intensity) components of the video signal are transmitted using a single cable. See Figure 10.

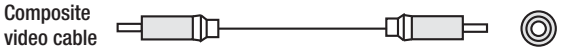


Figure 10 – Composite Video

Component video separates the video signal into three components – one luminance ("Y") and two sub-sampled color signals ("Pb" and "Pr") – that are transmitted using three separate cables. See Figure 11.

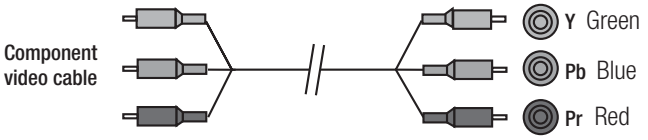


Figure 11 – Component Video

If it's available on your video display, an HDMI connection is recommended as the best quality connection, followed by component video, and then composite video.

NOTE: Copy-protected sources are not available at the Component Video Monitor Outputs.

ANTENNAS

The AVR 1600 uses separate terminals for the included FM and AM antennas.

The FM antenna uses a 75-ohm F-connector. See Figure 12.

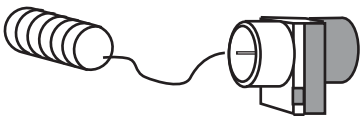


Figure 12 – FM Antenna

The AM loop antenna needs to be assembled. Connect the two leads to the spring terminals on the receiver. The AM antenna leads have no polarity, and you may connect them to either terminal. See Figure 13.

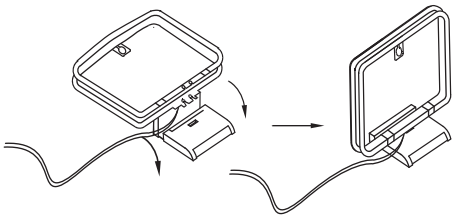


Figure 13 – AM Antenna

USB PORT

The USB Port on the AVR 1600 is used only for software upgrades. If an upgrade for the receiver's operating system is released in the future, it may be downloaded to the AVR using this port. Complete instructions will be provided at that time.

Optimally, the speakers should be placed in a circle with the listening position at its center. The speakers should be angled so that they directly face the listening position.

Front Speaker Placement

The center speaker is placed either on top of, below or mounted on the wall above or below the video display screen.

The front left and right speakers are placed along the circle, about 30 degrees from the center speaker and angled toward the listener.

Place the front left/right and center speakers at the same height, preferably at about the same height as the listener's ears. The center speaker should be no more than 2 feet above or below the left/right speakers. If you're using only two speakers with the AVR 1600, place them in the front left and right positions.

Placement of the surround speakers depends on the number of speakers in your system.

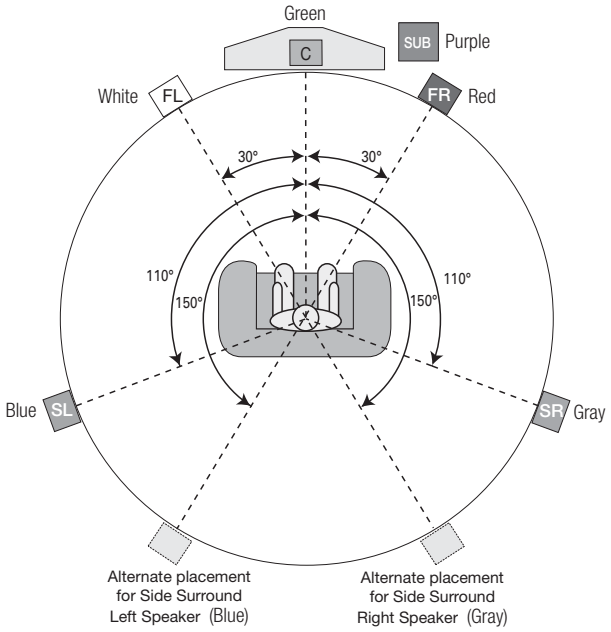


Figure 14 – Speaker Placement (5.1-Channel System)

Placement of Surround Speakers in a 5.1-Channel System

The side surround speakers should be placed 110 degrees from the center speaker, slightly behind and angled toward the listener. Alternatively, place them behind the listener, with each surround speaker facing the opposite-side front speaker. See Figure 14. The surround speakers may be placed a little higher than the listener's ears.

Placement of Surround Speakers in a 7.1-Channel System

In a 7.1-channel system, the side surround speakers are placed 90 degrees from the center speaker, directly to either side of the listening position. The surround back left and right speakers are placed 150 degrees from the center speaker, or directly facing the opposite-side front speaker. See Figure 15.

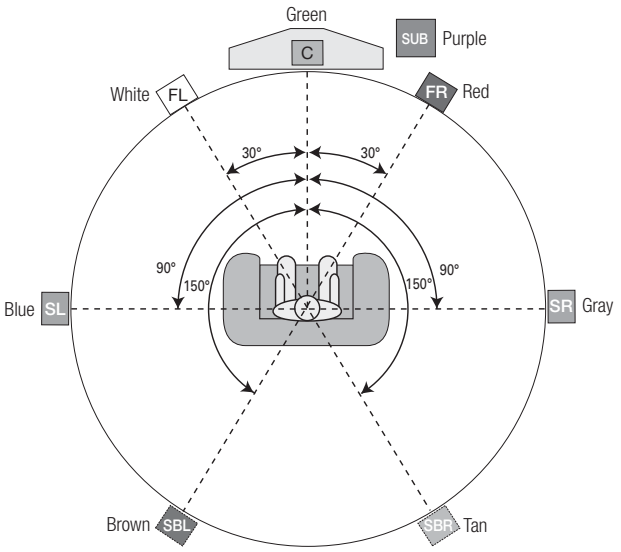


Figure 15 – Speaker Placement (7.1-Channel System)

NOTE: Some speaker manufacturers offer 6.1-channel speaker systems, for 6.1-channel surround sound formats, such as Dolby Digital EX, DTS-ES Discrete and Matrix modes and DTS Neo:6 mode. Using the AVR 1600 in a 6.1-channel configuration is not recommended. The 6.1-channel formats will sound better when played through a 7.1-channel system. The same surround back channel information is played through both surround back speakers, but with twice the power and clarity.

To use the AVR 1600 with a 6.1-channel speaker system, place the single surround back speaker directly behind the listener, but do not connect it until after you have run the EzSet/EQ procedure for a 5.1-channel system. After the EzSet/EQ process finishes, connect the surround back speaker to the Surround Back Left Speaker Output. Then follow the directions in the Advanced Functions section for manual setup of the surround back speaker.

Subwoofer Placement

Placement of the subwoofer is less critical, since low-frequency sounds are omnidirectional. Placing the subwoofer close to a wall or in a corner will reinforce the low frequencies, and may create a "boomy" sound. Temporarily place the subwoofer where the listener normally sits, then walk around the room until the low frequencies sound best. Place the subwoofer in that spot.

NOTE: Your receiver will sound its best when the same model or brand loudspeaker is used for all positions.

Installing the AVR 1600 and connecting it to the other system components can be complicated. To simplify installation, it is suggested that you design your system before you begin connecting wires and cables.

Although the rear-panel jacks allow for a variety of audio and video connections to other components, the AVR organizes the connections into six conventional sources: DVD (Blu-ray Disc player or DVD player), CD, Tape (audio recorder), Video 1 (VCR), Video 2 (Cable/Sat) and Video 3 (TV). Each of these sources uses dedicated analog audio inputs, and the DVD and Video 1/2/3 sources also use dedicated composite video inputs.

The AVR 1600 also features six digital audio inputs (2 each coaxial and optical on the rear panel, and 1 of each type on the front panel). The digital audio inputs, which offer improved performance when available on the source device, may be assigned to any source, as explained in the Initial Setup section.

The two component video inputs offer improved video performance when available on the source device and video display, and may also be assigned to any source.

The 6-/8-Channel Analog Audio Inputs are selected as a separate source, but may only be used with one of the two component video inputs.

For superior audio and video performance the AVR 1600 is equipped with three dedicated HDMI inputs, which may be used with any type of source device that has an HDMI output. The HDMI inputs may be used with an analog or digital audio input or one of the component video inputs. This flexibility facilitates using the AVR with sources that do not output multichannel audio through their HDMI outputs.

Table A1 in the appendix indicates the default audio/video connection assignments. If the defaults suit your system, then connect your devices to the audio/video inputs shown. Otherwise, design your system as explained below.

1. Best video connection type for your system: Examine the video inputs on your TV or video display. Write down the best available video connection type here: _____.

The options, in order of preference, are: HDMI, DVI (must be HDCP-compliant), component video or composite video. This is the "system-best" video connection for your system.

2. Decide which source will be used for each device: Match up to six devices to the six conventional sources listed in the Table 2 worksheet below. Any source device with compatible output connectors may be connected to any source inputs on the AVR. Matching the source devices to the named sources simplifies setup and programming the remote control. It is recommended that you match source devices as follows:

- **DVD:** Blu-ray Disc player or DVD player (Remote may only operate Harman Kardon Blu-ray Disc players, or many brands of DVD players).
- **VIDEO 1:** VCR, PVR (such as Tivo), DVD recorder
- **VIDEO 2:** Cable or satellite set-top box
- **VIDEO 3:** TV (video display) or HDTV set-top box
- **CD:** CD player
- **TAPE:** Cassette deck or audio recorder (Remote may only operate Harman Kardon cassette decks).
- **HDMI 1, 2 or 3:** Any device equipped with an HDMI output. The device type is selected from one of the other options while programming the remote.
- **AUX:** Portable audio player (Remote is not programmable to operate this device).

3. Best video connection for each source: Examine each source device and write down the best available type of video connection, but not better than the system-best connection. Leave blank audio-only sources, such as a CD player.

4. Best audio connection for each source: For each source device, write down the best available type of audio connection. See the note below, and if the HDMI connection may be used for audio, it is the best option. The other options, in order of preference, are: optical digital audio, coaxial digital audio, 2-channel analog audio.

Table 2 – Source Assignment Worksheet

Source	Device Type	Best Video Connection (HDMI, DVI, Component, Composite)	Video Input Assigned	Best Audio Connection (HDMI, Optical, Coaxial, 2-Ch Analog	Audio Input Assigned (may be one digital plus one or more analog)	Analog Audio Input for Recording
Video 1	VCR					
Video 2	Cable or Sat					
DVD	Blu-ray Disc or DVD					
Video 3	TV					
CD	CD					
Tape	Cassette deck					
AUX	Portable player					
HDMI 1						
HDMI 2						
HDMI 3						
6-/8-Channel				6-/8-Channel	6-/8-Channel	

If you select an HDMI input, that becomes the AVR source for the device. If you select a 2-channel analog audio input, that input becomes the AVR source. The digital audio inputs will be assigned to a source during Initial Setup.

NOTES:

- For multichannel disc players, if both the device and the TV use HDMI connections for video, then check the owner's manual for the device to determine whether it transmits multichannel audio via its HDMI output. If it does, then no separate audio connection is required. If not, write down the multichannel analog audio connection in addition to any other audio type. An analog video connection in addition to the HDMI connection will be required. See page 30 for more information.
- If the device uses an HDCP-compliant DVI output for video, then connect it to one of the AVR's HDMI Inputs using an HDMI-to-DVI adapter, but a separate audio connection will always be required.
- The AUX Input jack on the rear panel requires a 1/8" stereo audio mini-plug. Purchase a stereo audio cable with 1/8" mini-plugs at both ends. Connect one end to the 1/8" headphone jack found on may portable audio players, and plug the other end of the cable into the AUX Input jack. The AUX Input may also be used with audio devices that have conventional left and right analog audio output jacks. Purchase a cable that has left and right "RCA-style" plugs at one end and a 1/8" mini-plug at the other end to connect the player to the AUX Input.

5. Decide which sources to connect to each of the video inputs: Assign only one unique video input to each source. Use the best type of video connection available for each source.

- If your system-best video connection is "HDMI", select up to three HDMI source devices and assign them to one of the four HDMI sources.
- If your system-best video connection is "Component", or if you have source devices with component video outputs that weren't assigned to one of the HDMI Inputs, assign up to two devices to one of the three numbered Component Video Inputs.
- If your system-best video connection is "Composite Video", or if you have source devices with composite video outputs that have not been assigned to any other video input, then assign the devices to one of the four conventional sources (DVD, Video 1, 2 or 3). The composite video inputs are dedicated to each source and may not be reassigned. Use the composite video input for the source you assigned to the device in #2 above.

NOTE: If the source device is a video recorder that will be used to record from other devices connected to the AVR, assign the recorder to the Video 1 Input, which has a recording output. Any of the Coaxial or Optical Digital Inputs may be assigned to the recorder for audio, if it is capable of making digital audio recordings. To make audio-only recordings, assign either the tape source to the recorder. It is not necessary to connect TiVo or PVR devices that will only record from their direct cable or satellite television signals to the AVR's recording outputs.

6. Decide which audio inputs to connect to each source: Assign only one unique digital audio input to each digital source. Analog audio inputs are used for analog sources, or as secondary connections for digital sources for backup or for recording. The 2-channel analog audio inputs are dedicated to the four conventional sources (DVD, Video 1, 2 or 3) and may not be reassigned. Use the 2-channel analog audio input for the source you assigned to the device in #2 above.

- Any source using an HDMI Input requires no additional connection for audio *unless:*
  - The source doesn't output multichannel audio through its HDMI output. Make a second connection to the 6-/8-Channel Analog Audio Inputs.
  - The source has an HDCP-compliant DVI output for video only. Assign a digital or analog audio input.
- For any source whose best audio connection is optical or coaxial digital audio, assign one of the three Optical or three Coaxial Digital Audio Inputs. Do not connect both types of digital audio to the same source device.
- You may use one of the 2-Channel Analog Audio Inputs for a digital source.
- You may also assign the 6-/8-Channel Analog Audio Inputs, if available, to a digital source. See page 30.
- Use the 2-channel Analog Audio Input for the source selected for the device in #2 above when the device is an analog source.

NOTE: If the source device is a digital audio recorder, it may be used with any of the Coaxial or Optical Digital Audio Inputs and the Coaxial Digital Audio Output. Both coaxial and optical signals are available at the Coaxial Digital Audio Output. To make analog recordings, assign either the Analog 2 or 4 Audio Inputs to the recorder, as both have recording outputs.

You are now ready to begin installing the AVR. Before beginning to connect the various components to the receiver, turn off all devices, including the AVR 1600, and unplug their power cords. ***Don't plug in any of the power cords until you have finished making all of your connections.***

The receiver generates heat. Select a location that leaves several inches of space on all sides. Avoid completely enclosing the receiver inside an unventilated cabinet. Place components on separate shelves rather than stacking them directly on top of the receiver. ***Never block the AVR's ventilation slots on the top and side panels. Doing so could cause the AVR to overheat, with potentially serious consequences.*** Some shelf surface finishes are delicate. Try to select a location with a sturdy surface finish.

TIP: Label each cable before connecting it, to avoid mistakes. Write a description of the cable on a blank adhesive label, e.g., "DVD", and fold the label around the cable about 6 inches from the end to be plugged into the AVR.

Almost all of the following installation steps are optional, depending on your system. Skip any step that does not apply to your system.

STEP ONE – Connect Source Devices

Leaving all AC power cords unplugged, connect the source devices to the AVR using the audio and video inputs you assigned in Table 2.

STEP TWO – Connect TV

Connect the system-best video input on the TV to the corresponding video monitor output on the AVR.

STEP THREE – Connect Loudspeakers

After you have placed your loudspeakers in the room as explained on page 21, connect each speaker to its color-coded terminal on the AVR. Maintain proper polarity by connecting the negative terminal on the speaker (usually colored black) to the negative terminal on the AVR (also colored black); and the positive terminal on the speaker (usually red) to the positive terminal on the AVR (color varies by channel; see Table 1 on page 18).

If you have a subwoofer, connect its line-level or LFE input to the purple Subwoofer Output.

NOTE: If the subwoofer only has speaker-level inputs, after you have configured the AVR using EzSet/EQ technology as described on page 28, connect the subwoofer's left and right speaker input terminals to the AVR's Front Left and Front Right Speaker Outputs, then connect the front left and right main speakers to the subwoofer's left and right speaker output terminals. Consult the owner's manual for the subwoofer for specific installation instructions.

STEP FOUR – Connect FM Antenna

Connect the included FM antenna to the 75-ohm FM antenna terminal.

STEP FIVE – Connect AM Antenna

Assemble the included AM antenna (see Figure 16) and connect it to the AM and Ground antenna terminals. The antenna is not polarized, and either lead may be connected to either terminal.

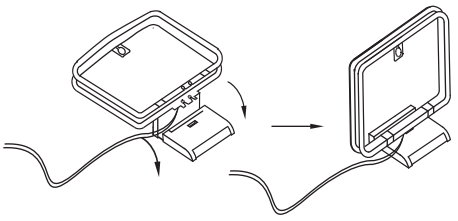


Figure 16 – AM Antenna Assembly

STEP SIX – Plug in AC Power Cords

Before plugging the AVR into an unswitched electrical outlet, make sure the Main Power Switch on the rear panel is off, to prevent the possibility of damaging the AVR in case of a transient power surge.

Plug the AC Power cord into an unswitched AC outlet.

It is recommended that you copy the appropriate information from the Table 2 worksheet to Table A5 in the appendix for future reference, in the event changes are made to the system components.

STEP SEVEN – Insert Batteries in Remote

The AVR 1600 remote control uses three AAA batteries (included).

To remove the battery cover located on the back of the remote, firmly press the ridged depression and slide the cover toward the top of the remote..

Insert the batteries as shown in Figure 17, observing the correct polarity.

Figure 17 – Remote Battery Compartment

Point the remote's lens toward the front panel of the AVR 1600. Make sure no objects, such as furniture, are blocking the remote's path to the receiver. Bright lights, fluorescent lights and plasma video displays may interfere with the remote's functioning. The remote has a range of about 20 feet, depending on the lighting conditions. It may be used at an angle of up to 30 degrees to either side of the AVR.

If the remote control seems to operate intermittently, or if pressing a button on the remote does not cause one of the Source Selectors to light, check or replace the batteries.

STEP EIGHT – Program Sources Into the Remote

The AVR 1600 remote may be programmed to control many brands and models of DVD players, cable boxes, satellite receivers, the Harman Kardon DMC 1000 digital media center and TVs.

To access the functions for a particular device, switch the remote's device mode. Press the AVR Button to access the codes that control the receiver, or the Source Selector Buttons to access the codes for the devices programmed into the remote.

While the DVD Source Selector may be used to operate either a Harman Kardon Blu-ray Disc player or a Harman Kardon DVD player, the default mode is to operate a Harman Kardon Blu-ray Disc player. To toggle between Harman Kardon Blu-ray Disc player and DVD player operation, press and hold the DVD Source Selector for 2 seconds. The source selector will flash twice to confirm that the remote's mode has changed to operate the other type of disc player.

NOTE: The remote may be easily programmed to operate the DMC 1000 digital media center, using the Video 1 or any of the HDMI Input Selectors, by following the instructions below. Select the VCR/PVR/DMC device type in number 4. Enter code 003.

If you have other source devices in your system, follow these steps to program the correct codes into the remote.

1. Using the codes in Tables A10–A16 of the Appendix, look up the product type (e.g., DVD, cable TV box) and the brand name of your source. The number(s) listed is/are potential candidates for the correct code set for your particular device.
2. Turn on your source device.
3. This step places the remote in program mode. Press and hold the Source Selector until the Program Indicator LED on the remote starts to flash, then release it. When pressed, the Source Selector will light red briefly, go dark, and then relight when the Program Indicator LED starts to flash.
4. Program the desired device type for any of the three HDMI selectors by pressing the corresponding Input Selector:
   - Press DVD to operate a DVD player.
   - Press VID1 to operate a VCR or PVR, or a Harman Kardon digital media center.
   - Press VID2 to operate a cable or satellite set-top box.
5. Enter a code from number 1 above.
   a) If the device turns off, then press the Input Selector again to accept the code; it will flash. The remote will exit the Program mode.
   b) If the device does not turn off, try entering another code. If you run out of codes, you may search through all of the codes in the remote's library for that product type by pressing the ▲ or ▼ Button repeatedly until the device turns off. When the device turns off, enter the code by pressing the Input Selector; it will flash. The remote then exits Program mode.
6. Once you have programmed a code, try using some other functions to control the device. Sometimes manufacturers use the same Power code for several different models, while other codes vary. Repeat this process until you've programmed a satisfactory code set that operates most of the functions you frequently use.
7. Find out which code number you have programmed by pressing and holding the Source Selector to enter the Program mode. Press the OK Button, and the Program Indicator LED will flash in the code sequence. One flash represents "1", two flashes for "2", and so forth. A series of many fast flashes represents "0". Record the codes programmed for each device in Table A7 in the Appendix.

If you are unable to locate a code set that correctly operates your source device, it will not be possible to use the AVR remote to control that device. You may still connect the source to the AVR 1600 and operate it using the device's original remote control.

Most of the button labels on the remote describe the button's function when used to control the AVR 1600. However, the button may perform a very different function when used to control another device. Refer to the Remote Control Function List, Table A9 in the Appendix, for each button's functions with the various product types.

You may program Macros, which are preprogrammed code sequences that execute many code commands with a single button press. You may also program "punch-through" codes, which allow the remote to operate the volume, channel or transport controls of another device without having to switch the remote's device mode. See pages 44 through 45 for instructions on these advanced programming functions.

NOTE: The AVR 1600 remote is preprogrammed to operate the transport controls of Harman Kardon DVD players when the AVR or the Video 2 (cable/satellite) or Video 3 (TV) source is selected. You may change this punch-through programming at any time.

STEP NINE – Turn On the AVR 1600

Two steps are required the first time you turn on the AVR 1600.

1. Flip the rear-panel Main Power Switch to the "On" position. The Power Indicator on the front panel will turn amber, indicating that the AVR is in Standby mode and is ready to be turned on. Normally, you may leave the Main Power Switch on, even when the receiver is not being used.
2. There are several ways to turn on the AVR from Standby mode.
   a) Press the Standby/On Switch on the front panel.
   b) Using the remote, press the Power On Button or any of the Source Selectors.

NOTES:

- Any time you press one of the Source Selectors on the remote, the remote will switch device modes. To control the receiver, press the AVR Button.
- If you do not see a picture within about one minute, refer to the Video Troubleshooting Tips on page 33.

In this section, you will configure the AVR 1600 to match your actual system. A video display must be connected to one of the video monitor outputs on the receiver.

USING THE ON-SCREEN MENU SYSTEM

Although it's possible to configure the AVR using only the remote and the front-panel messages, it is easier to use the full-screen menu system.

The menu system is accessed by pressing the OSD Button on the remote.

The Master Menu will appear (see Figure 18).

Figure 18 – Master Menu

The Master menu consists of five submenus: Input Setup, Surround Select, EzSet/EQ, Manual Setup and System Setup.

Use the ▼/▲ ◄/► Buttons on the remote to navigate the menu system, and press the OK Button to select a menu or setting line, or to enter a new setting.

The current menu, setting line or setting will appear in the Message Display, as well as on screen.

To return to the previous menu, navigate to the "Back to Master Menu" line and press the OK Button. To exit the menu system, press the OSD Button.

Most users should follow the instructions in this Initial Setup section to configure a basic home theater system. You may return to these menus at any time to make additional adjustments, such as those described in the Advanced Functions section.

Before beginning initial setup, all loudspeakers, a video display and all source devices should be connected. You should be able to turn on the receiver and view the master menu when you press the OSD Button. If necessary, reread the Installation Section and the beginning of this section before continuing.

Configure the AVR 1600, Using EzSet/EQ Technology

One of the most important steps in setting up a home theater system is to calibrate the receiver to match the loudspeakers, optimizing sound reproduction.

Until recently, most receivers required manual calibration and configuration, a tedious process that called for a good ear or the purchase of an SPL (sound-pressure level) meter. Although you may configure the AVR 1600 manually, as described in the Advanced Functions section, it is recommended that you take advantage of the signature Harman Kardon EzSet/EQ system.

Eliminate extraneous background noise, such as noisy air conditioning. Avoid making any loud noises while running EzSet/EQ setup.

IMPORTANT SAFETY NOTE: During the EzSet/EQ procedure, a series of very loud test sweeps will be played through all of the speakers. Avoid sitting or standing close to any one speaker during the procedure. If you are particularly sensitive to loud noises, you may wish to leave the room and have someone else run the EzSet/EQ process.

STEP ONE – Place the included EzSet/EQ microphone in the listening position or in the center of the room, at about the same height as the listeners' ears. The microphone features a threaded insert on the bottom, for mounting on a camera tripod.

STEP TWO – Plug the EzSet/EQ microphone into the Headphone Jack/EzSet/EQ Microphone Input Jack on the front of the receiver, and set the level control on the subwoofer to the halfway point.

STEP THREE – Turn on the AVR 1600 and the video display. Press the OSD Button to display the Master Menu. Use the ▼ Button to highlight the EzSet/EQ line, then press the OK Button. See Figure 19.

Figure 19 – Speaker Setup Menu Screen

Select "Yes", and a warning screen, followed by the screen shown in Figure 20, will appear.

Figure 20 – EzSet/EQ Screen

To return to the Speaker Setup menu without starting the EzSet/EQ process, select Cancel. When you are ready to begin.

Select the number of speakers in your system. Select 5.1 if no surround back speakers are present or if the surround back channels will be used for multizone operation.

NOTE: If there are fewer than five main speakers in your system, do not use the EzSet/EQ process. Instead, proceed as described in the Advanced Functions section. If you have selected a 6.1-channel configuration with a single surround back speaker, use EzSet/EQ automatic configuration for 5.1 speakers, connect the single surround back speaker to the left Surround Back Speaker Output, then configure the surround back speaker manually, as described in the Advanced Functions section. The 6.1-channel configuration is not recommended. If the subwoofer is to be connected to the Front Speaker Outputs, do not connect the subwoofer until after running the EzSet/EQ process.

NOTE: The AVR 1600 will automatically set its master volume to –25dB.

The test will begin, and a screen such as the one shown in Figure 21 will appear. Maintain silence during the EzSet/EQ configuration.

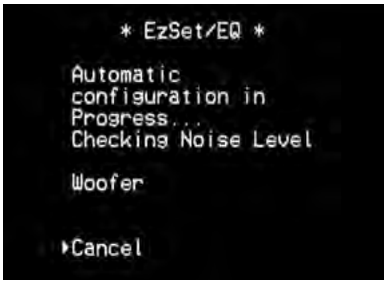


Figure 21 – EzSet/EQ EzSet/EQ in Progress

As the EzSet/EQ system tests each speaker, its position will appear on screen. If the test sweep is heard from a different speaker than the one indicated on screen, turn off the AVR and check the speaker-wire connections, then begin again.

When the test is completed, select the Continue option. The results will be displayed, along with these options:

- The Retest option repeats the EzSet/EQ process. Increase the master volume manually if some speakers were not correctly detected.
- Select Cancel to return to the Master menu.

See the Advanced Functions section for instructions on how to manually configure the speakers or manually adjust the settings established by the EzSet/EQ process.

Set Up Sources

The Input Setup menu is used to assign the correct physical audio and component video connections to each source.

The Audio In setting must be adjusted now, and if a component video input was used for the source, the Component In setting must also be adjusted. Otherwise, there will be no sound or picture when the source is playing.

To display the Input Setup menu, press the OSD Button. Select the Input Setup line and press the OK Button. A screen similar to the one shown in Figure 22 will appear.

Figure 22 – Setup Source Menu

Source: Indicates the currently selected source. Use the ◄/► Buttons to select a source: DVD, CD, TUNER (Radio), Tape, 8 CH DIRECT, AUX, VIDEO 1, VIDEO 2, VIDEO 3, HDMI 1, HDMI 2, HDMI 3.

Title: You may change the display name for any source (except the tuner). This may help you to select the correct source device even when you have forgotten which physical connections you used. Move the cursor to the TITLE line and press the OK Button. A block cursor will blink. Use the ▼/▲ Buttons to scroll through the alphabet in upper and lower case, the numbers and many punctuation marks. When you have selected the desired character, press the ► Button to move to the next space. Press the ► Button to leave a blank space. Press the OK Button when you have finished.

Component In: If you connected the source to one of the two component video inputs, press the ► Button to adjust the setting if needed.

NOTE: If the source is connected to a composite video input but a signal is present at the selected component video input, the AVR will display the component video signal. To avoid this, turn off the component video source device, or adjust this setting to select a component video input that is not in use. When no component video signal is present, the AVR will automatically select the composite video input associated with the source.

Audio In: If you used a digital audio connection for a source, change this setting to assign the correct digital audio input, even if you also connected its analog audio outputs to the receiver. Move the cursor to this line, and press the ◄/► Buttons until the correct digital input appears. If an analog audio connection was used, change this setting to ANALOG.

Auto Poll: The Auto Poll feature is used when both an analog audio and digital audio connection have been made for one source device. If no digital signal is available, the AVR 1600 will switch to the analog inputs for the source. This situation can occur with some cable or satellite television broadcasts, where some channels are broadcast with digital audio and others with analog audio, or when a DVD player is paused or stopped.

For some sources, the Auto Poll feature is unnecessary and may be undesirable, such as for a DVD player. Move the cursor to this line, and press the ◄/► Buttons until OFF appears, disabling the Auto Poll feature. With Auto Poll turned off, the receiver will only check for a signal at the audio input assigned to the source.

The remaining lines in the Input Setup menu adjust the audio performance, and may be skipped at this time. Leaving these settings at their factory defaults is recommended for most listening, in order

to enjoy the sound mix created by your favorite movie and music artists.

BXR: Enhances bass performance when playing MP3 tracks. Select ON, or leave at the default OFF setting for non-MP3 audio.

Tone: Determines whether the treble and bass controls are active. When it's off, the tone controls are "flat", with no changes. When it's on, the bass and treble frequencies are boosted or cut, depending upon the tone-control settings. When an analog audio source is in use and the 2-Channel Stereo surround mode is selected, setting the Tone to OFF places the unit in analog bypass mode.

Bass and Treble: Boost or cut the low or high frequencies by up to 10dB by using the ◄/► Buttons to change the setting by 2dB at a time.

6-/8-Channel Inputs

The 6-/8-Channel Analog Audio Inputs are used when playing certain multichannel discs (DVD-Audio, Blu-ray Disc, SACD and HD-DVD) on a player that decodes the audio and outputs it via its multichannel analog audio outputs but not via its HDMI output.

HDMI-Equipped Multichannel Disc Player:

- Connect the player's HDMI output to one of the AVR's HDMI Inputs. No other connections are necessary.
- Make sure the HDMI input is selected as the audio input in the Input Setup menu.

HDMI-Equipped Multichannel Disc Player That Does Not Output Multichannel Audio via an HDMI Connection:

- Connect the player's HDMI output and its multichannel analog audio outputs to one of the AVR's HDMI Inputs and to the AVR's 6-/8-Channel Analog Audio Inputs. In addition, connect the player's component video outputs to one of the AVR's Component Video Inputs.
- When listening to DVD-Video discs, CDs or other materials outputting standard-definition digital audio, select the HDMI Input as the source and as the Audio Input.
- To listen to high-resolution multichannel discs, select the 6-/8-Channel Analog Audio Inputs as the source, and select the component video input the player was connected to. It is not possible to view HDMI video while listening to multichannel analog audio.

Multichannel Disc Player Without HDMI Output, or When Video Display Has No HDMI Input:

- Connect the player's component video outputs to one set of Component Video Inputs on the AVR. Depending on the capabilities of the player and your video display, you may need to use the DVD composite video connection instead.
- Connect the player's digital audio output to a digital audio input on the AVR.
- Connect the player's multichannel audio outputs to the AVR's 6-/8-Channel Analog Audio Inputs.
- When listening to DVD-Video discs, CDs or other materials outputting standard-definition digital audio, select the DVD source, and make sure the digital audio input he player is connected to is selected as the audio input in the Input Setup menu. If a component video connection was made, select the correct input at the COMPONENT IN line of the Input Setup menu. If the DVD Video input was used, it will automatically be selected.
- To listen to high-resolution multichannel discs, select the "6/8 Channel" source. Change it back to the digital audio input to listen to standard-resolution digital materials.

NOTE: The 6-/8-Channel Inputs pass the incoming signals directly to the volume control, without digitizing or processing them. It is not possible to change the surround mode or adjust any of the tone controls when using the 6-/8-Channel Inputs. Configure the bass management settings (i.e., speaker size, delay and output level) on your source device to match the settings programmed using the EzSet/EQ procedure, which may be viewed using the Speaker Setup menu (see Advanced Functions section). Consult the owner's guide for your multichannel player for more information.

System Settings

The AVR 1600 offers system settings that make the receiver easier to use. Access these settings by pressing the OSD Button and navigating to the SYSTEM SETUP line of the MASTER MENU. Press the OK Button to display the submenu. See Figure 23.

Figure 23 – System Setup Menu Screen

VFD Fade Time Out: Some people find the brightness of the AVR's front-panel display distracting during movies or listening sessions. It's possible to dim the front-panel display completely using the Dim function (see below). This sets the display to remain dark most of the time, lighting up only when a button is pressed or a remote command is received, and going dark again 5 seconds after the last command. The VFD FADE TIME OUT feature also causes the display to light up only when a button is pressed or a change in the incoming signal is detected, but the display immediately begins to fade to dark. This setting allows you to program the length of the fade time. Select a time-out period of between 3 and 10 seconds, or select OFF if you prefer to leave the displays on at all times or to use the Dim function.

Volume Default and Default Volume Set: These two settings are used together to program the AVR's volume level at turn-on. This feature avoids discomfort for listeners in case the last user turned the volume very high. Press the OSD Button to remove the display from the screen so that you may adjust the volume to a desired level while a source is playing. Make a note of the number that appears in the display, and return to the SYSTEM SETUP menu. At the DEFAULT VOL SET line, select the desired volume setting, and activate the feature by setting VOLUME DEFAULT to ON.

HDMI Audio to TV: Determines whether HDMI audio signals are passed through the HDMI Output to the video display. In normal operation, leave this setting OFF, as audio will be played through the AVR. To use the TV by itself, without the home theater system, turn this setting ON. Mute the TV's speakers when using the AVR for audio.

Semi OSD Time Out: Program the amount of time (2 to 5 seconds) the two-line semi-OSD status messages remain on screen, or deactivate the semi-OSD display altogether if you find it distracting. These messages will continue to appear on the front panel of the receiver.

Full OSD Time Out: Program the amount of time (20, 30, 40 or 50 seconds) the full-OSD menus remain visible on screen. The full-OSD system may not be deactivated.

> **NOTE:** It isn't possible to view video sources while the full-OSD menus are displayed.

To dim the Message Display, press the Dim Button on the remote. Each button press will cycle through the three settings of:

- **VFD Full:** Normal brightness
- **VFD Half:** Display is dimmed but still visible; the light inside the volume knob goes dark
- **VFD Off:** Display goes completely dark except for Power Indicator to remind you that the receiver is turned on.

When you have finished, press the OSD Button to clear the menus from view.

You are now ready to begin enjoying your new receiver!

Now that you have installed your components and completed a basic configuration, you are ready to begin enjoying your home theater system.

TURNING ON THE AVR 1600

Flip the rear-panel Main Power Switch to the "On" position. The Power Indicator on the front panel will turn amber, indicating that the AVR is in Standby mode and is ready to be turned on. The Main Power Switch is normally left on.

There are several ways to turn on the AVR 1600:

a) Press the Standby/On Switch on the front panel.

b) Using the remote, press the Power On Button or any of the Source Selectors.

To turn the receiver off, press either the Standby/On Switch on the front panel or the Power Off Button on the remote control. Unless the receiver will not be used for an extended period of time, leave the Main Power Switch on. When the Main Power Switch is turned off, any settings you have programmed will be preserved for up to four weeks.

IMPORTANT NOTE: If the PROTECT message ever appears in the Message Display, turn off the AVR and unplug it. Check all speaker wires for a short. If none is found, bring the unit to an authorized Harman Kardon service center for inspection and repair before using it again.

VOLUME CONTROL

Adjust the volume either by turning the knob on the front panel (clockwise to increase volume or counterclockwise to decrease volume), or by pressing the Volume Control on the remote. The volume is displayed as a negative number of decibels (dB) below the 0dB reference point.

0dB is the maximum recommended volume for the AVR 1600. Although it's possible to turn the volume to a higher level, doing so may damage your hearing and your speakers. For certain more dynamic audio materials, even 0dB may be too high, allowing for damage to equipment. Use caution with regard to volume levels.

To change the volume level display from the default decibel scale to a 0-to-90 scale, adjust the Volume Units setting in the System Settings menu, as described on page 45.

MUTE FUNCTION

To temporarily mute all speakers and the headphones, press the Mute Button on the remote. Any recording in progress will not be affected. The MUTE message will appear in the display as a reminder. To restore normal audio, press the Mute Button again, or adjust the volume. Turning off the AVR will also end muting.

SLEEP TIMER

The sleep timer sets the AVR to play for up to 90 minutes and then turn off automatically.

Press the Sleep Settings Button on the remote, and the time until turn-off will be displayed. Each additional press of the Sleep Button decreases the play time by 10 minutes. The SLEEP OFF setting disables the sleep timer.

If you press the Sleep Button after the timer has been set, the remaining play time will be displayed. Press the Sleep Button again to change the play time.

TONE CONTROLS

You may boost or cut either the treble or the bass frequencies by up to 10dB.

Press the Tone Mode Button once. This will indicate whether the tone controls are in or out of the circuitry. With the TONE IN message displayed, press the Tone Mode Button repeatedly to access TREBLE MODE and BASS MODE. Use the ▼/▲ Buttons to change the treble or bass settings.

To return the tone controls to 0, or "flat" response, press the Tone Mode Button, and then use the ▼/▲ Buttons to display the TONE OUT message, which preserves any changes you have made to the bass or treble settings for later use. To reactivate your changes, the tone control must be set to TONE IN.

The display will return to normal a few seconds after your last command.

You may also adjust the tone controls using the full-OSD menu system. Press the OSD Button on the remote to view the Master Menu. With the cursor pointing to the INPUT SETUP line, press the OK Button to display the Input Setup menu and view the current tone settings. To make changes to the TONE, BASS or TREBLE settings, use the ▼/▲ Buttons to move the cursor to the setting, and use the ◄/► Buttons to adjust it. It isn't necessary to press the OK Button to enter the new setting.

When you have finished, either wait until the display times-out and disappears, press the OSD Button to clear the display, or move the cursor to the BACK TO MASTER MENU line and select it to make other changes using the menu system.

NOTE: The AVR 1600 does not have a conventional balance control. The speaker output level calibration process compensates for any characteristics of your room or speakers, and it is recommended that you leave the settings as they are after you have completed Initial Setup. However, you may manually adjust the levels of the left and right channels – decreasing one and increasing the other by the same amount – using the Channel Adjust submenu, as described in the Advanced Functions section. This achieves the same effect as a balance control.

HEADPHONES

Plug the 1/4-inch plug on a pair of headphones into the front-panel jack for private listening. The default Headphone Bypass mode delivers a conventional 2-channel signal to the headphones.

Press the Surround Modes Button on the front panel or the remote, to switch to Harman Headphone virtual surround processing, which emulates a 5.1-channel speaker system. No other surround modes are available for the headphones.

SOURCE SELECTION

- Use the front-panel ▼/▲ Source Buttons to scroll through the sources.

- Using the on-screen menus, press the OSD Button, highlight "Input Setup" and press the OK Button. Use the ◄/► Buttons to select a source.
- For direct access to any source, press its Source Selector on the remote.

The AVR selects the audio and video inputs assigned to the source, and any other settings made during setup.

The source name, the audio and video inputs assigned to the source, and the surround mode will appear on the front panel. The source name and surround mode will also appear on screen.

VIDEO TROUBLESHOOTING TIPS:
If there is no picture:

- Check the source selection and video input assignment.
- Check the wires for a loose or incorrect connection.
- Check the video input selection on the display device (TV).

Additional Tips for HDMI Connections:

- Turn off all devices (including the TV, AVR and any source components).
- Unplug the HDMI cables, starting with the cable between the TV and AVR, and continuing with the cables between the AVR and each source device.
- Carefully reconnect the cables from the source devices to the AVR. Connect the cable from the AVR to the TV last.
- Turn on the devices in this order: TV, AVR, source devices.

USING THE RADIO

To select the AVR 1600's built-in radio:

1. Use the front panel ▼/▲ Source Buttons to scroll to the desired band.
2. Press the AM/FM Source Selector on the remote. Press it again to switch bands.

Use the ▼/▲ Tuning Buttons to tune a station, as displayed on the front panel and on screen.

The AVR defaults to automatic tuning, meaning each press of the ▼/▲ Tuning Buttons scans through all frequencies until a station with acceptable signal strength is found. To switch to manual tuning, in which each press of the ▼/▲ Tuning Buttons steps through a single frequency increment (0.1MHz for FM, or 10kHz for AM), press the Tuning Mode Button on the remote. Each press of the Tuning Mode Button toggles between automatic and manual tuning modes.

When an FM station has been tuned, toggling the tuning mode also switches between stereo and monaural play, which may improve reception of weaker stations.

A total of 30 stations (AM and FM together) may be stored as presets. When the desired station has been tuned, press the Memory Button on the remote, and two dashes will flash. Use the Numeric Keys to enter the desired preset number.

To tune a preset station: Press the ▼/▲ Buttons or enter the preset number using the Numeric Keys.

RECORDING

Two-channel analog and digital audio signals, as well as composite video signals, are normally available at the appropriate recording outputs. To make a recording, connect your audio or video recorder to the appropriate output jacks, as described in the Installation section, insert blank media and make sure the recorder is turned on and recording while the source is playing.

NOTES:

1. Analog and digital audio signals are not converted to the other format.
2. Only PCM digital audio signals are available for recording. Proprietary formats such as Dolby Digital and DTS may not be recorded using the digital audio connections. Use the analog audio connections to make an analog recording.
3. HDMI and component video sources that are HDCP-copy protected are not available for recording.
4. Please make certain that you are aware of any copyright restrictions on any material you record. Unauthorized duplication of copyrighted materials is prohibited by federal law.

AUX INPUT

Enjoy the full power and resolution of your Harman Kardon system, including a variety of analog surround modes, while listening to content stored on your portable device.

The Auxiliary Audio Input mini jack is provided on the AVR's rear panel for convenient connection of portable players, such as CD players and the iPod (iPod and cable not included). Purchase a stereo cable with a 1/8" plug on at least one end for connection to the Auxiliary Audio Input. Plug the other end of the cable into the portable device's headphone output, and operate the device using its own controls. You may also use a cable with separate left and right audio plugs at one end for connection to any component equipped with analog audio outputs.

No video connection is available with the AUX input. However, the AVR will use the last-selected analog video input when the AUX source is selected.

SELECTING A SURROUND MODE

Surround mode selection can be as simple or sophisticated as your individual system and tastes. Feel free to experiment, and you may find a few favorites for certain sources or program types. More detailed information on surround modes may be found in the Advanced Functions section.

To select a surround mode, press the OSD Button on the remote to display the Master Menu. Use the ▼/▲ Buttons to move the cursor to the SURROUND SELECT line and press the OK Button. The Surround Modes menu will appear (see Figure 24). Use the ▼/▲ Buttons repeatedly until the desired surround mode category appears: Auto Select, Virtual Surround, Stereo, Movie, Music or Video Game. Press the OK Button to change the type's surround mode.

Figure 24 – Surround Modes Menu

Auto Select: For digital programs, such as movies recorded with a Dolby Digital soundtrack, the AVR will automatically use the native surround format. For 2-channel analog and PCM programs, the AVR uses Logic 7 Movie, Music or Game mode, depending on the source.

Virtual Surround: When only two main speakers are present in the system, Harman Virtual Surround may be used to create an enhanced sound field that virtualizes the missing speakers.

Stereo: When 2-channel playback is desired, select the number of speakers used for playback:

- 2 CH STEREO uses only two speakers. As described on page 38, you may select Analog Bypass mode for a pure analog signal when analog audio inputs are in use. Turn off the Tone Control setting in the Audio Effects submenu, and the AVR does the rest.
- 5 CH STEREO plays the left-channel signal through the front and surround left speakers, the right-channel signal through the right speakers and a summed mono signal through the center speaker.
- 7 CH STEREO follows the same scheme as 5 CH STEREO, but adds the surround back speakers. This mode is only available when the surround back speakers are present and have not been reassigned to multizone operation. See page 40 for more information.

Movie: Use when a surround mode is desired for movie playback: Logic 7 Movie, DTS Neo:6 Cinema or Dolby Pro Logic II (IIx when seven main speakers are present).

Music: Use when a surround mode is desired for music playback: Logic 7 Music, DTS Neo:6 Music or Dolby Pro Logic II (IIx when seven main speakers are present). The Dolby Pro Logic II/IIx Music mode allows access to a submenu with some additional settings. See the Advanced Functions section for more information.

Video Game: Use to select a surround mode for game playback: Logic 7 Game, or Dolby Pro Logic II (IIx when seven main speakers are present) Game.

After you have made your selection, Use the ▼/▲ Buttons to move the cursor to the BACK TO SURROUND SELECT line and press the OK Button, then select the BACK TO MASTER MENU line and press the OK Button to make additional adjustments. When you are finished using the menu system, press the OSD Button to clear the full-OSD menus from view (the semi-OSD display will appear).

See the Advanced Functions section for more information on surround modes.

Much of the AVR 1600's performance is handled automatically, with little intervention required on your part. The AVR 1600 is capable of being customized to suit your system and your tastes. In this section, some of the more advanced adjustments available are described.

AUDIO PROCESSING AND SURROUND SOUND

Audio signals output by sources are encoded in a variety of formats that can affect not only the quality of the sound but the number of speaker channels and the surround mode. You may also manually select a different surround mode, when available.

Analog Audio Signals

Analog audio signals usually consist of two channels – left and right. The AVR 1600 offers three options for playback:

1. **Analog Bypass Mode:** The 2-channel signal is passed directly from the input to the volume control, without being digitized or undergoing any processing for bass management or surround sound. To select analog bypass mode:
   a) The analog audio inputs for the source must be selected. If necessary, with the remote in AVR device mode, press the Digital Select Button and use the ▼/▲ Buttons to select "ANALOG".
   b) The tone controls must be disabled by turning off the Tone Control setting. With the remote in AVR device mode, press the Tone Button and use the ▼/▲ Buttons to select "TONE OUT".
   c) The 2-channel Stereo mode must be selected. Press the OSD Button, and use the ▼/▲ Buttons to select "SURROUND SELECT". Press the OK Button. Use the ▼/▲ Buttons to select "STEREO", and press the OK Button. Use the ◄/► Buttons to select either the 2- or 7-Channel Stereo mode.

NOTE: Audio from The Bridge III source is analog, and when 2-channel Stereo mode is selected, the audio will be played in Analog Bypass mode.

2. **DSP Surround Off Mode:** The DSP Surround Off mode digitizes the incoming signal and applies the bass management settings, including speaker configuration, delay times and output levels. Select this mode when your front speakers are small, limited-range satellites and you are using a subwoofer. To select this mode, use a digital audio input, or set the Tone Control setting to IN, and select 2-channel Stereo mode.
3. **Analog Surround Modes:** The AVR 1600 is able to process 2-channel audio signals to produce multichannel surround sound, even when no surround sound has been encoded in the recording. Among the available modes are the Dolby Pro Logic II/IIx modes, the Harman Virtual Speaker modes, the DTS Neo:6 modes, the Logic 7 modes and the Stereo modes.

Digital Audio Signals

Digital audio signals offer greater capacity, which allows the encoding of center and surround channel information directly into the signal. The result is improved sound quality and startling directionality, since each channel is reproduced discretely.

Even when only two channels are encoded, the digital signal allows for a higher sampling rate that delivers greater detail. High-resolution recordings sound extraordinarily distortion-free, especially at high frequencies.

Surround Modes

Surround mode selection is dependent upon the format of the incoming audio signal, as well as personal taste. Table A13 offers a brief description of each mode and indicates the types of incoming signals or digital bitstreams the mode may be used with. Additional information about the Dolby and DTS modes is available on the companies' Web sites: www.dolby.com and www.dtsonline.com.

When in doubt, check the jacket of your disc for more information on which surround modes are available. Usually, nonessential sections of the disc, such as trailers, extra materials or the disc menu, are only available in Dolby Digital 2.0 (2-channel) or PCM 2-channel mode. If the main title is playing and the display shows one of these surround modes, look for an audio or language setup section in the disc's menu. Also, make sure your player's audio output is set to the original bitstream rather than 2-channel PCM. Stop play and check the player's output setting.

For any incoming signal, only a limited number of surround modes are available. Although there is never a time when all of the AVR 1600's surround modes are available, there is usually a wide variety of modes available for a given input.

Multichannel digital recordings are found in the 5.1-, 6.1- or 7.1-channel formats. The channels included in a 5.1-channel recording are front left, front right, center, surround left, surround right and LFE. The LFE channel is denoted as ".1" to represent the fact that it is limited to the low frequencies.

6.1-Channel recordings add a single surround back channel, and 7.1-channel recordings add surround back left and surround back right channels to the 5.1-channel configuration. New formats are available in 7.1-channel configurations. The AVR 1600 is able to play the new audio formats, delivering a more exciting home theater experience.

NOTE: To use the 6.1- and 7.1-channel surround modes, the Surround Back channels must be enabled. See the Manual Speaker Setup section on page 39 for more information.

The Digital formats are Dolby Digital 2.0 (two channels only), Dolby Digital 5.1, Dolby Digital EX (6.1), Dolby Digital Plus (7.1), Dolby TrueHD (7.1), DTS-HD High-Resolution Audio (7.1), DTS-HD Master Audio (7.1), DTS 5.1, DTS-ES (6.1 Matrix and Discrete), DTS 96/24 (5.1), 2-channel PCM modes in 32kHz, 44.1kHz, 48kHz or 96kHz, and 5.1 or 7.1 multichannel PCM.

When a digital signal is received, the AVR 1600 detects the encoding method and the number of channels, which is displayed briefly as three numbers, separated by slashes (e.g., "3/2/.1").

The first number indicates the number of front channels in the signal:

"1" represents a monophonic recording, usually an older program that has been digitally remastered or, more rarely, a modern program for which the director has chosen a special effect.

"2" indicates the presence of the left and right channels, but no center channel.

"3" indicates that all three front channels (left, right and center) are present.

The second number indicates whether any surround channels are present:

"0" indicates that no surround information is present.

"1" indicates that a matrixed surround signal is present.

"2" indicates discrete left and right surround channels.

"3" is used with DTS-ES bitstreams to represent the presence of the discrete surround back channel, in addition to the side surround left and right channels.

"4" is used with 7.1-channel digital formats to indicate the presence of two discrete side surround channels and two discrete back surround channels.

The third number is used for the LFE channel:

"0" indicates no LFE channel.

".1" indicates that an LFE channel is present.

The 6.1-channel signals – Dolby Digital EX and DTS-ES Matrix and Discrete – each include a flag meant to signal the receiver to decode the surround back channel, indicated as 3/2/.1 EX-ON for Dolby Digital EX materials, and 3/3/.1 ES-ON for DTS-ES materials.

Dolby Digital 2.0 signals may include a Dolby Surround flag indicating DS-ON or DS-OFF, depending on whether the 2-channel bitstream contains only stereo information, or a downmix of a multichannel program that can be decoded by the AVR's Dolby Pro Logic decoder. By default, these signals are played in Dolby Pro Logic IIx Movie mode.

When a PCM signal is received, the PCM message and the sampling rate (32kHz, 44.1kHz, 48kHz or 96kHz) will appear.

When only two channels – left and right – are present, the analog surround modes may be used to decode the signal into the remaining channels. If you would prefer a different surround format than the native signal's digital encoding, press the OSD Button, and use the ▼/▲ Buttons to select "SURROUND SELECT". Press the OK Button. Use the ▼/▲ Buttons to select one of the surround mode categories.

The Auto Select option uses the native signal's digital encoding, e.g., Dolby Digital, DTS, Dolby TrueHD or DTS-HD Master Audio. For 2-channel materials, the AVR defaults to Logic 7 Movie mode. If you prefer a different surround mode, select the surround mode category: Virtual Surround, Stereo, Movie, Music or Video Game. Press the OK Button to change the mode.

Each category is set to a default surround mode:

- **Virtual Surround:** Harman Virtual Speaker
- **Stereo:** 7-channel stereo
- **Movie:** Logic 7 Movie
- **Music:** Logic 7 Music
- **Video Game:** Logic 7 Game

You may select a different mode. The choice of surround modes depends on the number of speakers in your system.

- **Virtual Surround:** Harman Virtual Speaker
- **Stereo:** 2-channel stereo, 5-channel stereo or 7-channel stereo
- **Movie:** Logic 7 Movie, DTS Neo: 6 Cinema, Dolby Pro Logic II Movie, Dolby Pro Logic IIx Movie
- **Music:** Logic 7 Music, DTS Neo: 6 Music, Dolby Pro Logic II Music, Dolby Pro Logic IIx Music
- **Video Game:** Logic 7 Game, Dolby Pro Logic II Game, Dolby Pro Logic IIx Game

Once you have programmed the surround mode for each type of audio, select the line from the Surround Select menu to override the AVR's automatic surround mode selection. The AVR will use the same surround mode the next time the source is selected.

Please refer to Table A13 in the appendix for more information on which surround modes are available with different bitstreams.

Dolby Surround Settings

Some additional settings are available for Dolby modes. When the Dolby Pro Logic II or IIx Music modes have been selected, the Center Width, Dimension, Panorama and Night Mode settings will be available. See Figure 25.

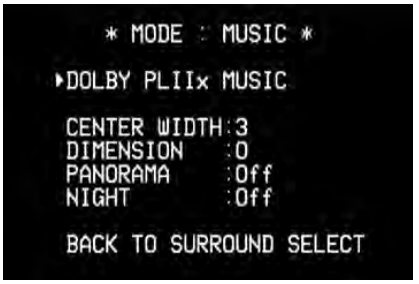


Figure 25 – Dolby Pro Logic II/IIx Music Mode Settings

Center Width: This setting affects how vocals sound through the three front speakers. A higher number (up to 7) focuses the vocal information tightly on the center channel. Lower numbers broaden the vocal soundstage. Use the ◄/► Buttons to adjust.

Dimension: This setting affects the depth of the surround presentation, allowing you to "move" the sound toward the front or rear of the room. The setting of "0" is a neutral default. Setting "F-03" moves the sound toward the front of the room, while setting "R-03" moves the sound toward the rear. Use the ◄/► Buttons to adjust.

Panorama: With the Panorama mode turned On, some of the sound from the front speakers is moved to the surround speakers, creating an enveloping "wraparound" effect. Each press of the OK Button toggles the setting on or off.

Night Mode: Night mode is available with some Dolby Digital programs, if it has been encoded in the material. It compresses the peak sound levels, maintaining the intelligibility of the dialogue and quieter passages, while reducing the loudness of special effects and louder passages to avoid disturbing others. Three levels of compression are available:

- **Off:** At this setting, there is no compression, as the Night mode is deactivated.
- **Half:** A mild compression is applied.
- **Full:** More compression is applied.

MANUAL SPEAKER SETUP

The AVR 1600 is flexible and may be configured for most speakers, and to compensate for the acoustic characteristics of your room.

The EzSet/EQ process automatically detects the capabilities of each speaker, and optimizes the AVR 1600's performance. If you are unable to run EzSet/EQ calibration, or if you wish to make further adjustments, use the Manual Speaker Setup on-screen menus.

Before beginning, place your loudspeakers as explained in the Speaker Placement section, and connect them to the AVR. Consult the owner's guide for the speakers or the manufacturer's Web site for the frequency range specification. Although you may set the output levels "by ear," an SPL (sound-pressure level) meter purchased at a local electronics store will provide greater accuracy.

Record your configuration settings in Tables A3 through A12 in the appendix for easy re-entry after a system reset, or if the AVR's Master Power Switch is turned off or the unit is unplugged for more than four weeks.

STEP ONE – Determine Speaker Crossover

Without using the EzSet/EQ process, the AVR 1600 can't detect how many speakers you've connected to it; nor can it determine their capabilities. Consult the speaker's technical specifications and locate the frequency response, usually given as a range, e.g., 100Hz – 20kHz (±3dB). Write down the lowest frequency that each of your main speakers is capable of playing (100Hz in the example) as the crossover in Table A3 in the appendix. This is not the same as the crossover frequency listed in the speaker's specifications. For the subwoofer, write down the transducer size.

The receiver's bass management determines which speakers will be used to play back the low-frequency (bass) portion of the source program. Sending the lowest notes to small satellite speakers won't sound right, and may even damage the speaker. The highest notes may not be heard at all through the subwoofer.

With proper bass management, the AVR 1600 divides the source signal at a crossover point. All information above the crossover point is played through the satellite speaker, and all information below the crossover point is played through the subwoofer. Each loudspeaker in your system performs at its best, delivering an enjoyable sound experience.

STEP TWO – Measure Speaker Distances

Ideally, all of your speakers would be placed in a circle, with the listening position at the center. However, you may have had to place some speakers a little further away from the listening position than others. Sounds that are supposed to arrive simultaneously from different speakers may blur, due to different arrival times.

Use the AVR's delay adjustment to compensate for real-world speaker placements.

Measure the distance from each speaker to the listening position, and write it down in Table A4 in the appendix. Even if all of your speakers are the same distance from the listening position, enter your speaker distances as described in Step Three.

STEP THREE – Manual Setup Menu

Now you are ready to program the receiver. Sit in the usual listening position and make the room as quiet as possible.

With the receiver and video display turned on, press the Setup Button to display the Master Menu. Use the ▼ Button to move the cursor to the Manual Setup line, and press the OK Button to display the Manual Setup menu.

If you have run the EzSet/EQ process, the results were saved. To tweak the EzSet/EQ results, or to configure the AVR 1600 from scratch, use the menu shown in Figure 26.

Figure 26 – Manual Setup Menu

NOTE: All of the speaker setup submenus include the Back option, to go back to the previous menu, shown at the bottom of Figure 29.

For best results, adjust the submenus in this order: Number of Speakers, Crossover (Size), Sub Mode, Distance and Level Adjust.

Number of Speakers

Move the cursor to the Number of Speakers line and press the OK Button. See Figure 27.

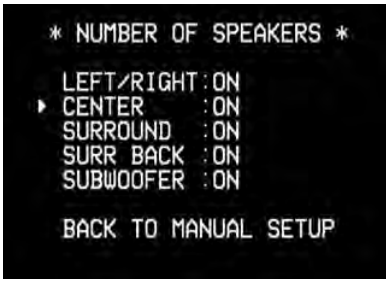


Figure 27 – Number of Speakers Menu

Program the correct setting for each speaker group: ON when the speakers are present in the system, and OFF for positions where no speakers are installed. The Front Left & Right speakers are always ON and may not be disabled. Any changes will be reflected in the total number of speakers displayed at the top of the screen.

The settings in this menu affect the remainder of the speaker setup process and the availability of various surround modes at any time.

When you have finished, select the Back option or use the Back/Exit Button.

Crossover Menu

After you have programmed the number of speakers, return to the Manual Setup menu (see Figure 29). Navigate to the Crossover line and press the OK Button to display the Crossover menu (see Figure 28).

Figure 28 – Crossover Menu

The AVR will only display those speaker groups programmed in the Number of Speakers menu.

Refer to Table A3 for each speaker's crossover. For the main speakers, this is the lowest frequency the speaker reproduces well.

For each main speaker, select one of the seven crossover frequencies: 40Hz, 60Hz, 80Hz, 100Hz, 120Hz, 150Hz or 200Hz. If the crossover frequency is below 40Hz, select the first option, "Large". This setting doesn't refer to the speaker's physical size, but to its frequency response, which is also called "full range".

You may specify the size of the subwoofer's transducer as 8, 10, 12 or 15 inches. The AVR always sets the subwoofer crossover to 100Hz, but uses the transducer size for equalization. Write down the settings in Table A3 in the appendix.

When you have finished entering the settings, select Back, to Manual Setup.

Sub Mode

Move the cursor to the Sub Mode line in the Manual Setup menu. This setting depends upon how you programmed the front left and right speakers.

- If you set the front speakers to a numeric crossover frequency, the subwoofer setting will always be SUB. All low-frequency information will always be sent to the subwoofer. If you don't have a subwoofer, either upgrade to full-range speakers or add a subwoofer at the earliest opportunity.
- If you set the front speakers to LARGE, select one of the three settings for the subwoofer.
  - **L/R+LFE:** This setting sends all low-frequency information to the subwoofer, including both information that would normally be played through the front left and right speakers, and the special low-frequency effects (LFE) channel information.
  - **Off:** Select this setting when no subwoofer is in use. All low-frequency information will be sent to the front left and right speakers.
  - **LFE:** This setting plays low-frequency information contained in the left and right program channels through the front speakers, and directs only the LFE channel to the subwoofer.

NOTE: If you are using a Harman Kardon HKTS Series speaker system, select the appropriate numeric crossover frequency for the Main Speaker groups, and the subwoofer will automatically be set to LFE.

Distance Menu

Placing the speakers at different distances from the listening positions can muddy the sound, as sounds are heard earlier or later than desired.

Even if all of your speakers are placed the same distance from the listening position, do not skip this menu.

On the Manual Setup menu, move the cursor to the Distance line and press the OK Button to display the Distance menu. See Figure 29.

Figure 29 – Adjust Speaker Distance Menu

Enter the distance from each speaker to the listening position, as measured in Step Two – Measure Speaker Distances and recorded in Table A4 in the appendix (see page 40).

The default unit of measurement is feet. To change the unit to meters, scroll down to the Unit setting. Use the ◄/► Buttons to toggle the setting between FEET and METERS.

Select a speaker, then use the ◄/► Buttons to change the measurement. The values vary between 0 and 30 feet, with a default of 10 feet for all speakers. To reset all of the settings to their default values, scroll down to the DELAY RESET setting and use the ◄/► Buttons to change this setting to ON, where it will remain until any of the speaker delay settings are changed.

A/V SYNC DELAY: This line allows you to compensate for a "lip sync" problem, in which a source device or the video display introduces a significant amount of video processing that causes the audio and video parts of the signal to lose synchronization. You may delay the audio for all channels by up to 180 milliseconds to compensate.

NOTE: We recommend adjusting the A/V Sync Delay using the Delay Button on the remote, so as to view the picture while adjusting the audio delay. With the program playing, press the Delay Button, and the A/V SYNC DELAY message will appear on the front panel and in the semi-OSD display. Press the OK Button to display the current delay setting, and use the ◄/► Buttons to adjust the setting until the picture and sound are back in sync.

STEP FOUR – Setting Channel Output Levels Manually

For a conventional 2-channel receiver, the balance control affects the stereo imaging by adjusting the relative loudness of the left and right channels.

With up to seven main channels, plus a subwoofer, imaging becomes both more critical and more complex. The goal is to ensure that each channel is heard at the listening position with equal loudness.

EzSet/EQ calibration can handle this critical task for you, simply and automatically. However, the AVR's Level Adjust menu allows you to calibrate the levels manually, either using the system's test tone or while playing source material.

1. Make sure all speakers have been placed and connected correctly.
2. Adjust the number of speakers, crossover, distance and sub mode for each speaker in your system, as described in Step Three.
3. Measure the channel levels in one of these ways, and adjust the channel levels using the Level Adjust menu:
   a) Preferably, use a handheld SPL meter set to the C-Weighting, Slow scale. Adjust each channel so that the meter reads 75dB.
   b) By ear. Adjust the levels so that all channels sound equally loud.
   c) If you are using a handheld SPL meter with source material, such as a test disc or an audio selection, play it and adjust the AVR's master volume control until the meter measures 75dB.

Press the OSD Button to display the Master Menu, and then navigate to the Manual Setup line. Press the OK Button to display the Manual Setup menu. Select the Level Adjust line and press the OK Button to display the Level Adjust menu. See Figure 30.

* LEVEL ADJUST *
FL :- 2dB SBR:- 6dB
CEN:+ 3dB SBL:- 3dB
FR :+ 3dB SL :+ 1dB
SR :+ 1dB SUB:- 2dB
CHANNEL RESET:OFF
TEST TONE SEQ:MANUAL
TEST TONE :OFF
BACK TO MANUAL SETUP

Figure 30 – Level Adjust Menu

All of the speaker channels will appear with their current level settings.

Channel Reset: To reset all of the levels to their factory defaults of 0dB, navigate to this line and change the setting to ON. The levels will be reset, and this setting will remain ON until one of the channel levels is adjusted.

If you are using an external source to set your output levels, navigate to each channel and use the ◄/► Buttons to adjust the level as desired. If you would like to set your levels using the AVR 1600's internal test tone, adjust the TEST TONE SEQ and TEST TONE lines as follows.

Test Tone SEQ: When this setting reads AUTO, the test tone will automatically circulate to all channels, pausing for a few moments at each channel for several seconds, as indicated by the blinking cursor. Adjust the level for any channel when the test tone is paused there by using the ◄/► Buttons. You may also use the ▼/▲ Buttons at any time to move the cursor to another line, and the test tone will follow the cursor.

When this setting reads MANUAL, the test tone will not move to the next channel until you use the ▼/▲ Buttons.

Test Tone: This line determines whether the test tone is active. To begin the process of setting the levels, use the ◄/► Buttons to change the setting to ON. Any time you manually move the cursor out of the channel listings area of the screen, this setting will automatically change to OFF, stopping the test tone.

Individual Channels: If you are using an external source to set your output levels, navigate to each channel and use the ◄/► Buttons to adjust the level, between –10dB and +10dB. The level settings are global for all sources and surround modes.

When you have finished adjusting the speaker levels, select the Back to Manual Setup option or press the OSD Button. Record the level settings in Table A3 in the appendix.

AUDIO SETTINGS

To adjust other audio settings, such as the tone controls, press the OSD Button to display the Master Menu. With the cursor pointing to INPUT SETUP, press the OK Button to display the Input Setup menu, where the source, its title, its component video and audio inputs and Auto Polling status may be adjusted, as described in the Initial Setup section. However, this section will focus on the four audio settings:

BXR: Enhances bass performance when playing MP3 tracks. Select On, or leave at the default Off setting for non-MP3 audio.

Tone: Determines whether the treble and bass controls are active. When it's OUT, the tone controls are "flat", with no changes. When it's IN, the bass and treble frequencies are boosted or cut, depending upon the tone-control settings. When an analog audio source is in use and the 2-Channel Stereo surround mode is selected, setting the Tone Control to "OUT" places the unit in analog bypass mode.

Treble and Bass: Boost or cut the high or low frequencies by up to 10dB, 2dB at a time by using the ◄/► Buttons. The default setting is 0dB.

When you have finished, press the OSD Button.

SYSTEM SETTINGS

The AVR 1600 offers system settings for ease of use. These settings may be accessed from the System SETUP menu, which is selected by pressing the OSD Button and navigating to the System Setup line. Press the OK Button to display the System SETUP menu. See Figure 31.

Figure 31 – Systems Setup Menu

VFD Fade Time Out: Some people find the brightness of the AVR's front-panel display distracting during movies or listening sessions. It's possible to dim the front-panel display completely using the Dim function (see below). This sets the display to remain dark most of the time, lighting up only when a button is pressed

or a remote command is received, and going dark again 5 seconds after the last command. The VFD FADE TIME OUT feature also causes the display to light up only when a button is pressed or a change in the incoming signal is detected, but the display immediately begins to fade to dark. This setting allows you to program the length of the fade time.

Select a time-out period of between 3 and 10 seconds, or select OFF if you prefer to leave the displays on at all times or to use the Dim function.

Volume Default and Default Volume Set: These two settings are used together to program the AVR's volume level at turn-on. This feature avoids discomfort for listeners in case the last user turned the volume very high.

Press the OSD Button to remove the display from the screen so that you may adjust the volume to a desired level while a source is playing. Make a note of the number that appears in the display, and return to the SYSTEM SETUP menu. At the DEFAULT VOL SET line, select the desired volume setting, and activate the feature by setting VOLUME DEFAULT to ON.

HDMI Audio to TV: Determines whether HDMI audio signals are passed through the HDMI Output to the video display. In normal operation, leave this setting Off, as audio will be played through the AVR. To use the TV by itself, without the home theater system, turn this setting On. Mute the TV's speakers when using the AVR for audio.

Semi OSD Time Out: Program the amount of time (2 to 5 seconds) the two-line semi-OSD on-screen messages remain, or deactivate the semi-OSD display altogether if you find it distracting. These messages will continue to appear on the front panel of the receiver.

Full OSD Time Out: Program the amount of time (20, 30, 40 or 50 seconds) the full-OSD menus remain visible on screen. The full-OSD system may not be deactivated.

NOTE: It isn't possible to view video sources while the full-OSD menus are displayed.

When you are finished using the SYSTEM SETUP menu, select the BACK TO MASTER MENU option to continue making adjustments to the AVR, or press the OSD Button to clear the screen.

Dim Function

Some people find the front-panel messages to be distracting and would prefer to dim them or turn them off altogether. When the display is dimmed or darkened, it will return to full brightness for 5 seconds any time a command is received before dimming or darkening again. To dim the display, press the Dim Button on the remote. Each button press will cycle through the three settings of:

- **VFD Full:** Normal brightness
- **VFD Half:** Display is dimmed but still visible; the light inside the volume knob goes dark
- **VFD Off:** Display goes completely dark except for Power Indicator to remind you that the receiver is turned on

ADVANCED REMOTE CONTROL FUNCTIONS

The remote control not only operates the AVR 1600, but it also serves as a universal remote that may be programmed to operate many of your other home theater components, as described in the Installation section.

Each time you select one of your other components, the AVR remote switches to the control functions for that component. Since many buttons have unique functions for each component, refer to the Function List in Table A9 of the Appendix for assistance in operating your other components. Each button's function will not necessarily correspond to its label.

Punch-Through Programming

The AVR 1600 remote's punch-through feature allows you to select one component for the remote to operate, while simultaneously setting certain groups of controls to operate another component. For example, while using the AVR to control surround modes and other audio functions, you may operate the transport controls of your DVD player. Or while using the remote to control video functions on your TV, you may use your cable box to change channels and the AVR to control the volume.

NOTES:

- It is not necessary to program the remote to control your DVD player's transport controls while the AVR, VID2 or VID3 devices are in use, as the remote is preprogrammed at the factory with this function.
- When in DVD device mode, the remote may be used to control either a DVD player or a Harman Kardon Blu-ray Disc player. To toggle between these two device modes, press and hold the DVD Input Selector until it flashes. The factory default is to operate a Harman Kardon Blu-ray Disc player.

To program punch-through control while operating any device:

1. Press and hold the Input Selector (or AVR selector) for the main device the remote will be operating until the Program LED flashes and the remote enters Program mode.
2. Select the type of punch-through programming.
   a) To program volume control punch-through, press the Volume Up Button.
   b) To program channel control punch-through, press the Volume Down Button.
   c) To program transport control punch-through, press the Play Button.
3. Press the Input Selector (or AVR Selector) for the device whose volume, channel or transport controls you would like to be active while operating the device you selected in the first step. The LED will flash green to confirm the programming. For example, if you wish to watch your TV (programmed into the Video 3 Button) while changing channels using your cable box (Video 2), first press and hold the Video 3 Button until the LED flashes. Then press the Volume Down Button, followed by the Video 2 Button.

To undo punch-through programming, follow the same steps as above, but press the same Input (or AVR) Selector in Steps 1 and 3.

You may reassign the transport control punch-through programming for the AVR, VID2 and VID3 devices to other devices, such as CD. If you wish to remove transport control punch-through altogether for the AVR, VID2 or VID3 device, follow the same procedure as for programming punch-through, but in Step 3 press either of the other two of these three special selector buttons. For example, to remove punch-through transport control from the VID3 device so that pressing any of the transport controls will have no effect, press and hold the VID3 Button until the Program Indicator LED flashes in amber, then press the Play Button, followed by either the AVR or VID2 Button.

Macros

Macros are used to program sequences of up to 19 commands that are executed with a single button press. Macros are well suited for power on and off commands, or to send out a favorite multidigit channel number with one button press, or to have the ability to send out a code sequence to control a device while the remote is operating another device, but with more flexibility than the built-in punch-through controls.

Some commands may not be programmed into macros: Mute, Dim, or Channel Up/Down.

NOTE: Use caution when programming complicated macros. It isn't possible to program a pause or delay before sending commands after Power On, and the component may not be ready to respond to commands instantaneously after powering on.

To program, or "record" a macro, follow these steps:

1. Simultaneously press one of the four Macro Buttons or the Power On Button and the Mute Button to enter program mode.
2. Press the Input (or AVR) Selector for each device before you enter commands to be transmitted to that device. This step counts as one of the 19 commands allowed for each macro.
3. For the Power On command, DO NOT press the Power On Button. Press the Mute Button instead.
4. Press the Power Off Button to program the Power Off command.
5. Press the Sleep Button to end the programming process.

To execute the macro, press the Macro Button (or the AVR Power On Button) selected in the first step of programming the macro.

It isn't possible to "edit" a command within a macro. However, you may erase the macro as follows:

1. Simultaneously press and hold the Mute Button and the Macro Button containing the macro until the LED flashes.
2. Press the Channel Down Button to erase the macro.

Resetting the Remote

To reset the remote to its factory defaults, simultaneously press and hold any Input Selector and the "0" Numeric Key. When the Program LED flashes in amber, enter the code "333". When the green LED goes out, the remote will have been fully reset.

PROCESSOR RESET

If the unit behaves erratically after a power surge, first turn off the Main Power Switch and unplug the AC power cord for at least 3 minutes. Plug the cord back in and turn the receiver on. If this doesn't help, reset the AVR.

NOTE: A system reset erases all user configurations, including Source settings, speaker and level settings, and tuner presets. After a reset, reenter all of these settings from your notes in the appendix worksheets.

To reset the AVR 1600, place it in Standby mode (press the front-panel Standby/On Switch so that the Power Indicator turns amber). Then press and hold the front-panel Surround Mode Button for at least 5 seconds until the RESET message appears.

If the receiver does not function correctly ofter a processor reset, contact an authorized Harman Kardon service center for assistance. Authorized service centers may be located by visiting the Web site at www.harmankardon.com.

MEMORY

If the AVR 1600 is unplugged or experiences a power outage, it will retain user settings for up to four weeks.

Symptom	Cause	Solution
Unit does not function when Main Power Switch is turned on	• No AC Power	• Make certain AC power cord is plugged into a live outlet • Check whether outlet is switch-controlled
Display lights, but no sound or picture	• Intermittent input connections • Mute is on • Volume control is down	• Secure all input and speaker connections • Press Mute Button • Turn up volume control
No sound from any speaker; PROTECT message appears on front panel	• Amplifier is in protection mode due to possible short • Amplifier is in protection mode due to internal problems	• Check speaker wires for shorts at receiver and speaker ends • Contact your local Harman Kardon service center
No sound from surround or center speakers	• Incorrect surround mode • Input is monaural • Incorrect configuration • Stereo or Mono program material	• Select a mode other than Stereo • There is no surround information from mono sources • Check speaker configuration • The surround decoder may not create center- or rear-channel information from nonencoded programs
Unit does not respond to remote commands	• Weak batteries in remote • Wrong device selected • Remote sensor is obscured	• Change remote batteries • Press the AVR Button • Make certain front-panel sensor is in line of sight of remote or connect an optional remote sensor
Intermittent buzzing in tuner	• Local interference	• Move unit or antenna away from computers, fluorescent lights, motors or other electrical appliances

Additional information on troubleshooting possible problems with your AVR 1600, or installation-related issues, may be found in the list of “Frequently Asked Questions”, which is located in the Product Support section at www.harmankardon.com.

Appendix – Default settings, worksheets, remote product codes

Table A1 – Recommended Source Component Connections

Device Type	AVR 1600 Source	Audio Connections	Video Connections
VCR, DVR, PVR, TiVo or other audio/video recorder	Video 1	• Video 1 Analog (inputs and outputs) **and** • Any one available coaxial or optical digital audio input with corresponding coax digital output	• *One* of Component Video 2, Video 1 S-Video *or* Video 1 Composite Video Input • For recording, use Video 1 S-Video or Composite Video Output, and do not use component video connections at all
Cable TV, Satellite, HDTV or other device that delivers television programs	Video 2	• Video 2 Analog Inputs **and** • Optical 1 Input (if not in use with HDMI 3)	• *One* of Component Video 2, Video 2 S-Video, Video 2 Composite Video Input
TV, game console, camera or other audio/video device	Video 3 (front-panel jacks)	• Video 3 Analog Inputs **and** • Either Coax 3 or Optical 3 Input	• One of Component Video 2, Video 3 S-Video or Video 3 Composite Video Input
DVD Audio/Video, Blu-ray Disc, SACD, HD-DVD,	DVD	• DVD Analog Inputs • 6-Channel Inputs (optional) **and** • Coax 1 Input	• Component Video 1 Input
HDMI-capable disc player or other audio/ video device	HDMI 1	• HDMI 1 Input	• HDMI 1 Input
HDMI-capable disc player or other audio/ video device	HDMI 2	• HDMI 2 Input	• HDMI 2 Input
HDMI-capable disc player or other audio/video device	HDMI 3	• HDMI 3 Input	• HDMI 3 Input
Any audio device used with cable having 1/8" stereo audio mini plug	AUX	• AUX mini-jack input on rear panel	• Not required
CD player	CD	• CD analog inputs **and** • Any one available coaxial or optical digital audio input	• Not required
CD-R, miniDisc, cassette	Tape	• Tape Analog (inputs and outputs) **and** • Any one available coaxial or optical digital audio input • Use corresponding coax digital output	• Not required

Note: The AVR 1600 is equipped with a total of six digital audio inputs, four on the rear panel (Coaxial 1 and 2, Optical 1 and 2) and two on the front panel (Coaxial 3 and Optical 3), which may be assigned to any of the nine source inputs (DVD, Video 1 through 3, HDMI 1 through 3, CD and Tape). Certain digital audio connections are recommended simply because those digital audio inputs are assigned to those sources by default at the factory. But any digital audio input may be reassigned to any source. Since you may not be using all nine source inputs, you may reassign a digital audio input that is recommended for a source you aren't using to another device. Table A1 is a guideline; you may need to make adjustments to fit your system.

Table A2 – Source Setting Defaults

Source	DVD	HDMI 1	HDMI 2	HDMI 3	Video 1	Video 2	Video 3	AUX	CD	Tape	Tuner	6-/8-Channel
Title											INT. TUNER	
Component Video Input	Comp V 1	Comp V 1	Comp V 2	Comp V 2	Comp V 2	Comp V 2	Comp V 2	Comp V 1	Comp V 1	Comp V 1	Comp V 1	Comp V 1
Audio Input	Coax 1	HDMI	HDMI	HDMI	Analog	Optical 1	Analog		Analog	Analog		
Auto Poll	On	On	On	On	Off	On	Off		Off	On		
Surround Mode	Logic 7 Movie	Logic 7 Movie	Logic 7 Movie	Logic 7 Movie	Logic 7 Movie	Logic 7 Movie	Logic 7 Movie	Logic 7 Movie	Logic 7 Movie	Logic 7 Movie	Logic 7 Movie	

Table A3 – Speaker/Channel Setting Defaults

Source	All Sources	6-/8-Channel
Left/Right Speaker	On	Large
Center Speaker	On	Large
Surround Speaker	On	Large
Surround Back Speaker	On	Large
Subwoofer	On	Sub
Left/Right Speaker Crossover	100Hz	N/A
Center Speaker Crossover	100Hz	N/A
Surround Speaker Crossover	100Hz	N/A
Surround Back Speaker Crossover	100Hz	N/A
LFE	100Hz	N/A
Sub Mode	Sub	Sub

Table A4 – Delay Setting Defaults

Speaker Position	Distance From Speaker to Listening Position	Your Delay Settings
Front Left	10 feet	
Center	10 feet	
Front Right	10 feet	
Surround Right	10 feet	
Surround Left	10 feet	
Surround Back Right	10 feet	
Surround Back Left	10 feet	
Subwoofer	10 feet	
A/V Sync Delay	0mS	

Table A5 – Source Input Settings

Source	DVD	HDMI 1	HDMI 2	HDMI 3	Video 1	Video 2	Video 3	AUX	CD	Tape	Tuner	6-/8-Channel
Title											INT. TUNER	
Video Input												
Component Video Input												
Digital Audio Input								N/A			N/A	N/A
Analog Audio Input								AVR			TUNER	6-/8-CH
Auto Poll												

Table A6 – Speaker/Channel Settings

Source	DVD	HDMI 1	HDMI 2	HDMI 3	Video 1	Video 2	Video 3	AUX	CD	Tape	Tuner	6-/8-Channel†
Left/Right Speaker												N/A
Center Speaker												N/A
Surround Speaker												N/A
Surround Back Speaker												N/A
Subwoofer												N/A
Left/Right Speaker Crossover												N/A
Center Speaker Crossover												N/A
Surround Speaker Crossover												N/A
Surround Back Speaker Crossover												N/A
LFE												N/A
Submode												Sub
Left Channel Level												
Right Channel Level												
Center Channel Level												
Surround Left Channel Level												
Surround Right Channel Level												
Surround Back Left Channel Level												
Surround Back Right Channel Level												
Subwoofer Channel Level												

† The 6-channel inputs are “direct” inputs, meaning their signals are passed directly to the volume control without any bass management processing. Thus, the speaker sizes are always full-range, and it isn’t possible to adjust speaker size crossover.

Table A7 – Remote Control Codes

Source Input	Product Type (circle one)	Remote Control Code
Video 1	VCR, PVR, DMC	
Video 2	Cable, Satellite	
Video 3	TV	
HDMI 1	DVD, VCR/PVR/DMC, Cable/Satellite	
HDMI 2	DVD, VCR/PVR/DMC, Cable/Satellite	
HDMI 3	DVD, VCR/PVR/DMC, Cable/Satellite	
DVD	DVD, Harman Kardon Blu-ray Disc	
CD	CD, CD-R	
Tape	Cassette	

Table A8 – System Settings

Feature	Default Setting	Your Setting
VFD Fade Time-Out	Off	
Volume Default	Off	
Default Vol Set	–25dB	
HDMI Audio toTV	Off	
Semi-OSD Time-Out	5 Seconds	
Full-OSD Time-Out	20 Seconds	

Table A9 – Surround Modes

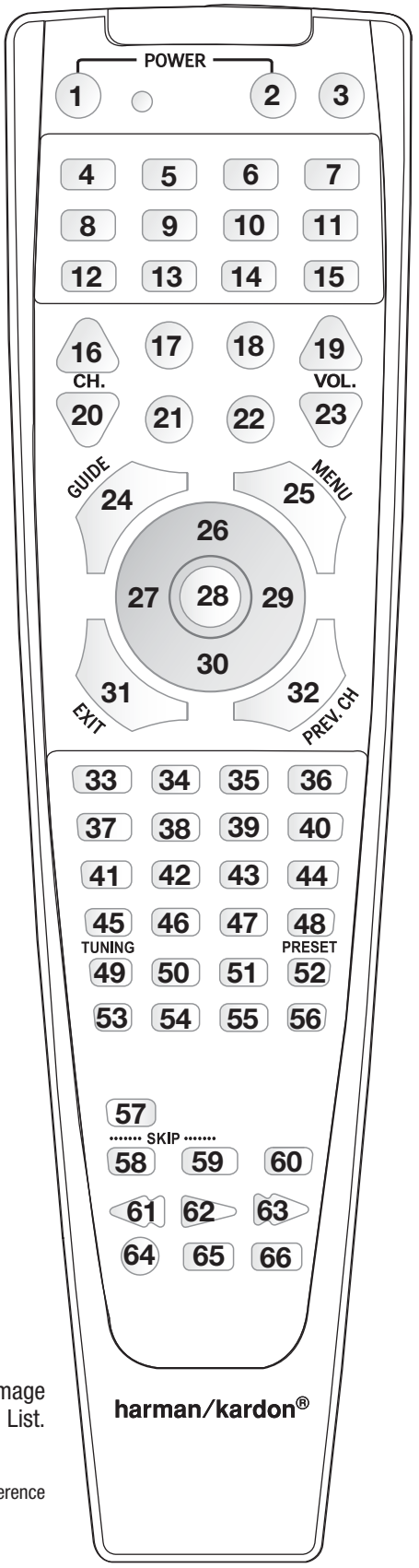
Surround Mode	Description	Incoming Bitstream or Signal
Dolby Digital	Provides up to five separate main audio channels and a dedicated low-frequency effects (LFE) channel.	• Dolby Digital 1/0/.0 or .1, 2/0/.0 or .1, 3/0/.0 or .1, 2/1/.0 or .1, 2/2/.0 or .1, 3/2/.0 or .1 • Dolby Digital EX (played as 5.1) • Dolby Digital Plus decoded and delivered via coax or optical connection
Dolby Digital EX	An expansion of Dolby Digital 5.1 that adds a surround back channel which may be played through one or two surround back speakers. May be manually selected when a non-EX Dolby Digital stream is detected.	• Dolby Digital EX • Dolby Digital 2/2/.0 or .1, 3/2/.0 or .1
Dolby Digital Plus	An enhanced version of Dolby Digital encoded more efficiently, Dolby Digital Plus has the capacity for additional discrete channels and for streaming audio from the Internet, all with enhanced audio quality. Source material may be delivered via an HDMI connection, or decoded to Dolby Digital or PCM and transmitted via S/P-DIF coaxial or optical digital audio.	• Dolby Digital Plus via HDMI connection (source device decodes to Dolby Digital when a coax or optical connection is used)
Dolby TrueHD	Dolby TrueHD is an expansion of MLP Lossless™ audio, the same format used on DVD Audio discs. Dolby TrueHD adds the features found in Dolby Digital, such as night mode settings, while delivering fully lossless audio that is a true reproduction of the studio master recording.	• Blu-ray Disc or HD-DVD encoded with Dolby TrueHD, delivered via HDMI
Dolby Digital Stereo	Delivers a 2-channel downmix of Dolby Digital materials.	• Dolby Digital 1/0/.0 or .1, 2/0/.0 or .1, 3/0/.0 or .1, 2/1/.0 or .1, 2/2/.0 or .1, 3/2/.0 or .1 • Dolby Digital EX
Dolby Pro Logic II Mode Group	Analog decoder that derives five full-range, discrete main audio channels from matrix surround-encoded or 2-channel analog sources. Four variants are available.	See below
Dolby Pro Logic II Movie	Variant of Dolby Pro Logic II that is optimized for movie and television programs.	• Dolby Digital 2.0 or 2.1 • Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz, 48kHz, 96kHz)
Dolby Pro Logic II Music	Variant of Dolby Pro Logic II that is optimized for music selections. Allows adjustment of sound field presentation in three dimensions: • Center Width (adjusts width of vocal soundstage) • Dimension (adjusts depth of soundstage) • Panorama (adjusts wraparound surround effect)	• Dolby Digital 2.0 or 2.1 • Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz, 48kHz, 96kHz)
Dolby Pro Logic II Game	Variant of Dolby Pro Logic II that emphasizes use of the surround channels and subwoofer for total immersion in the video gaming experience.	• Dolby Digital 2.0 or 2.1 • Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz, 48kHz, 96kHz)
Dolby Pro Logic	Original version of Dolby Pro Logic that steered a mono signal containing information below 7kHz to the surround channels.	• Dolby Digital 2.0 or 2.1 • Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz, 48kHz, 96kHz)
Dolby Pro Logic IIx Mode Group	An expansion of Dolby Pro Logic II that adds a surround back channel which may be played through one or two surround back speakers. The Dolby Pro Logic IIx modes may be selected not only with Dolby Digital bit-streams, but thanks to the AVR 1600's post-processor, they may also be used with some DTS bitstreams to add a surround back channel to 5.1 modes.	

Table A9 – continued

Surround Mode	Description	Incoming Bitstream or Signal
Dolby Pro Logic IIx Movie	This mode is similar to Dolby Pro Logic II Movie, with an added surround back channel.	• Dolby Digital 2/0/.0 or .1, 2/2/.0 or .1, 3/2/.0 or .1, EX • Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz, 48kHz, 96kHz)
Dolby Pro Logic IIx Music	This mode is similar to Dolby Pro Logic II Music, including the availability of center width, dimension and panorama adjustments. Dolby Pro Logic IIx Music adds a surround back channel.	• Dolby Digital 2/0/.0 or .1, 2/2/.0 or .1, 3/2/.0 or .1, EX • Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz, 48kHz, 96kHz)
Dolby Pro Logic IIx Game	This mode is similar to Dolby Pro Logic II Game, with the added benefit of a surround back channel.	• Dolby Digital 2/0/.0 or .1 • Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz or 48kHz)
Harman Virtual Speaker	Simulates 5.1 channels when only two speakers are present, or a more enveloping sound field is desired.	• Dolby Digital • Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz or 48kHz)
DTS Digital	Using a different encoding/decoding method than Dolby Digital, it also provides up to five discrete main channels, plus an LFE channel.	• DTS 1/0/.0 or .1, 2/0/.0 or .1, 3/0/.0 or .1, 3/1/.0 or .1, 2/2/.0 or .1, 3/2/.0 or .1 • DTS-ES Matrix (played as 5.1) • DTS-ES Discrete (played as 5.1)
DTS-HD	DTS-HD is a new high-definition audio format that complements the high-definition video found on Blu-ray Disc and HD-DVD discs. It is transmitted using a DTS core with high-resolution extensions. Even when only DTS 5.1 surround sound is desired (or available, if the multizone system is in use), the higher capacity of high-resolution discs serves up DTS at twice the bit rate used on DVD-Video discs.	• Blu-ray Disc or HD-DVD discs encoded with DTS-HD modes, delivered via HDMI
DTS-HD Master Audio	DTS-HD Master Audio technology delivers bit-for-bit reproductions of the studio master recording in up to 7.1 channels, for an incredibly accurate performance.	• Blu-ray Disc or HD-DVD discs encoded with DTS-HD Master Audio technology, delivered via HDMI
DTS-ES Matrix	DTS Extended Surround adds a single surround back channel to DTS 5.1 digital surround sound. The Matrix version includes the surround back channel information "matrixed" into the left and right (side) surround channels, for compatibility with 5.1-channel systems.	• DTS-ES Matrix
DTS-ES Discrete	DTS-ES Discrete is another Extended Surround mode that adds a surround back channel, but this information is encoded discretely on the disc, and is not derived from information contained in the surround channels.	• DTS-ES Discrete
DTS Stereo	Delivers a 2-channel downmix of DTS Digital materials, or presents a matrix-encoded surround presentation.	• DTS 1/0/.0 or .1, 2/0/.0 or .1, 3/0/.0 or .1, 3/1/.0 or .1, 2/2/.0 or .1, 3/2/.0 or .1 • DTS 96/24 • DTS-ES Matrix • DTS-ES Discrete
DTS Neo:6 Mode Group	DTS Neo:6 analog processing is available with DTS and DTS 96/24 signals and 2-channel analog or PCM signals to create a 3-, 5- or 6-channel presentation.	See below

Table A9 – continued

Surround Mode	Description	Incoming Bitstream or Signal
DTS Neo:6 Cinema	Depending on the number of speakers in your system, select 3-, 5- or 6-channel modes, enhanced for movie or video presentations.	• DTS 2/2/.0 or .1, 3/2/.0 or .1 • DTS 96/24 • Analog (2-channel) • PCM (32kHz, 44.1kHz or 48kHz)
DTS Neo:6 Music	Available only in 5- and 6-channel modes, creates a surround presentation suitable for music recordings.	• DTS 2/2/.0 or .1, 3/2/.0 or .1 • DTS 96/24 • Analog (2-channel) • PCM (32kHz, 44.1kHz or 48kHz)
Logic 7 Mode Group	A Harman International proprietary technology, Logic 7 technology enhances 2-channel and matrix-encoded recordings by deriving separate information for the surround back channels. This provides more accurate placement of sound, improves panning and expands the sound field, even when used with 5.1-channel systems. Logic 7 technology uses 96kHz processing, and is available in 5.1- or 7.1-channel modes. Three variants are available.	See below
Logic 7 Movie	Especially suited to 2-channel sources containing Dolby Surround or matrix encoding, Logic 7 Movie mode increases center channel intelligibility.	• Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz, 48kHz, 96kHz)
Logic 7 Music	The AVR 1600 is programmed at the factory to default to this mode for 2-channel signals. Logic 7 Music mode is well suited to conventional 2-channel music recordings.	• Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz, 48kHz, 96kHz)
Logic 7 Game	Use Logic 7 Game mode to enhance enjoyment of video game consoles.	• Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz, 48kHz, 96kHz)
5-Channel Stereo	Useful for parties, the left- and right-channel information is played through both the front and surround speakers on each side, while the center speaker plays a summed mono mix.	• Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz or 48kHz, 96kHz, 192kHz)
7-Channel Stereo	Expands the 5-Channel Stereo presentation to include the surround back channels.	• Analog (2-channel) • Tuner • PCM (32kHz, 44.1kHz or 48kHz, 96kHz, 192kHz)
2-Channel Stereo	Turns off all surround processing and plays a pure 2-channel signal or a downmix of a multichannel signal. The signal is digitized and bass management settings are applied, making it appropriate when a subwoofer is used.	• Analog (2-channel; DSP downmix available for multichannel) • Tuner • PCM (32kHz, 44.1kHz, 48kHz, 96kHz)
2-Channel Stereo (Analog Bypass)	Maintains an analog input signal in that form, bypassing all digital processing (i.e., surround and bass management). Requires Tone Control setting to be off.	• Analog (2-channel) • Tuner



Refer to the numbered buttons in this image when using the Function List.

Figure 32 – Remote Control Function List Reference

Table A10 – Remote Control Function List

No.	Button Name	AVR Function	DVD	CD/CD-R	Tape	VCR (VID1)	TiVo (VID1)	DMC (VID1/ HDMI 1/2/3)	CBL (VID2)	SAT (VID2)	TV (VID3)	HDMI 1/2/3
1	**Power On**	Power On	Power On	Power On		Power On	Power On/Off	Power On	Power On	Power On	Power On	Power On
2	**Power Off**	Power Off	Power Off	Power Off		Power Off	TV Power	Power Off	Power Off	Power Off	Power Off	Power Off
3	**Mute**	Mute	Mute	Mute	Mute	Mute	Mute	Mute	Mute	Mute	Mute	Mute
4	**AVR**	AVR Select	AVR Select	AVR Select	AVR Select	AVR Select	AVR Select	AVR Select	AVR Select	AVR Select	AVR Select	AVR Select
5	**DVD**	DVD Select	DVD Select	DVD Select	DVD Select	DVD Select	DVD Select	DVD Select	DVD Select	DVD Select	DVD Select	DVD Select
6	**VID 1 (VCR)**	Video 1 Select	VCR Select	VCR Select	VCR Select	VCR Select	VCR Select	VCR Select	VCR Select	VCR Select	VCR Select	VCR Select
7	**HDMI 1**	HDMI 1 Select	HDMI 1 Select	HDMI 1 Select	HDMI 1 Select	HDMI 1 Select	HDMI 1 Select	HDMI 1 Select	HDMI 1 Select	HDMI 1 Select	HDMI 1 Select	HDMI 1 Select
8	**AM/FM**	Tuner Select	Tuner Select	Tuner Select	Tuner Select	Tuner Select	Tuner Select	Tuner Select	Tuner Select	Tuner Select	Tuner Select	Tuner Select
9	**CD**	CD Select	CD Select	CD Select	CD Select	CD Select	CD Select	CD Select	CD Select	CD Select	CD Select	CD Select
10	**VID 2 (CBL/SAT)**	Video 2 Select	CBL/SAT Select	CBL/SAT Select	CBL/SAT Select	CBL/SAT Select	CBL/SAT Select	CBL/SAT Select	CBL Select	SAT Select	CBL/SAT Select	CBL/SAT Select
11	**HDMI 2**	HDMI 2 Select	HDMI 2 Select	HDMI 2 Select	HDMI 2 Select	HDMI 2 Select	HDMI 2 Select	HDMI 2 Select	HDMI 2 Select	HDMI 2 Select	HDMI 2 Select	HDMI 2 Select
12	**AUX**	AUX Select	AUX Select	AUX Select	AUX Select	AUX Select	AUX Select	AUX Select	AUX Select	AUX Select	AUX Select	AUX Select
13	**Tape**	Tape Select	Tape Select	Tape Select	Tape Select	Tape Select	Tape Select	Tape Select	Tape Select	Tape Select	Tape Select	Tape Select
14	**VID 3 (TV)**	Video 3 Select	TV Select	TV Select	TV Select	TV Select	TV Select	TV Select	TV Select	TV Select	TV Select	TV Select
15	**HDMI 3**	HDMI 3 Select	HDMI 3 Select	HDMI 3 Select	HDMI 3 Select	HDMI 3 Select	HDMI 3 Select	HDMI 3 Select	HDMI 3 Select	HDMI 3 Select	HDMI 3 Select	HDMI 3 Select
16	**Sleep/CH+**	Sleep	Audio			Channel +	Channel +	Audio	Channel +	Channel +	Channel +	Channel +
17	**Test Tone**	Test Tone						Find				
18	**6/8 CH**	6/8 Ch. Input Select	6/8 Ch. Input Select	6/8 Ch. Input Select	6/8 Ch. Input Select	6/8 Ch. Input Select	6/8 Ch. Input Select	6/8 Ch. Input Select	6/8 Ch. Input Select	6/8 Ch. Input Select	6/8 Ch. Input Select	6/8 Ch. Input Select
19	**Vol Up**	Volume Up	Volume Up	Volume Up		Volume Up	Volume Up	Title	Volume Up	Volume Up	Volume Up	Volume Up
20	**CH–**		Disc Menu or Title	CD-R Select		Channel –	Channel –	Info	Channel –	Channel –	Channel –	Channel –
21	**OSD**	OSD		Program		OSD	Live TV		OSD	OSD	OSD	OSD
22	**T/V**		TV/DVD or V. OFF	Input Select		TV/VCR	TV Input		TV/CBL	TV/SAT	TV/VCR	TV/Video
23	**Vol Down**	Volume Down	Volume Down	Volume Down		Volume Down	Volume Down		Volume Down	Volume Down	Volume Down	Volume Down
24	**CH./Guide**	Channel Trim	Title or Disc Menu	Continuous Play			Guide	Disc Menu	Info/Guide	Info/Guide		Guide
25	**Speaker/Menu**	Speaker Adjust	Menu or Setup	Intro Scan		Menu	Menu	Setup	Menu	Menu	Menu	Menu
26	**▲**	Move/Adjust Up	Up			Up	Up	Up	Up	Up	Up	Up
27	**◄**	Move/Adjust Left	Left			Left	Left	Left	Left	Left	Left	Left
28	**OK**	OK	Enter			Enter	Select	Enter	Enter	Enter	Enter	Set/Enter
29	**►**	Move/Adjust Right	Right			Right	Right	Right	Right	Right	Right	Right
30	**▼**	Move/Adjust Down	Down			Down	Down	Down	Down	Down	Down	Down
31	**Digital/Exit**	Digital Input Select	Open/Close				Return/Exit	Open/Close				
32	**Delay/Prev. Ch.**	Delay Adjust	Return or Status	Open/Close				Status	Prev Channel	Prev Channel	Prev Channel	Prev Channel
33	**1**	1	1	1		1	1	1	1	1	1	1
34	**2**	2	2	2		2	2	2	2	2	2	2
35	**3**	3	3	3		3	3	3	3	3	3	3
36	**4**	4	4	4		4	4	4	4	4	4	4
37	**5**	5	5	5		5	5	5	5	5	5	5
38	**6**	6	6	6		6	6	6	6	6	6	6
39	**7**	7	7	7		7	7	7	7	7	7	7
40	**8**	8	8	8		8	8	8	8	8	8	8
41	**Tun-M**	Tuner Mode	Chapter+ or Zoom	Repeat				Zoom				
42	**9**	9	9	9		9	9	9	9	9	9	9
43	**0**	0	0	0		0	0	0	0	0	0	0

Table A10 – continued

No.	Button Name	AVR Function	DVD	CD/CD-R	Tape	VCR (VID1)	TiVo (VID1) HDMI 1/2/3)	DMC (VID1/	CBL (VID2)	SAT (VID2)	TV (VID3)	HDMI 1/2/3
44	**Memory**	Memory	Audio or Playlist	Time				Source (DMC250 only)				
45	**Tuning Up**	Tuning Up	Next Chapter	Track Direct		Cancel			PPV	Cancel	Sleep	
46	**Direct**	Direct Tuner Entry	Angle	Random Play				Angle	FAV	FAV		Angle/FAV
47	**Clear**	Clear	Clear	Clear		Clear	Clear	Clear	Bypass	Next		
48	**Preset Up**	Preset Tune Up	Slow Forward	+10					Music	Alt		
49	**Tuning Down**	Tuning Down	Prev Chapter	Track Increment								
50	**Tone**	Tone mode						V-off				
51	**D. Skip**	Disc Skip (DVD)	Disc Skip	Disc Skip			Skip	Play Mode				
52	**Preset Down**	Preset Tune Down	Slow Rev									
53	**M1**	Macro 1	Macro 1	Macro 1	Macro 1	Macro 1	Macro 1	Macro 1	Macro 1	Macro 1	Macro 1	Macro 1
54	**M2**	Macro 2	Macro 2	Macro 2	Macro 2	Macro 2	Macro 2	Macro 2	Macro 2	Macro 2	Macro 2	Macro 2
55	**M3**	Macro 3	Macro 3	Macro 3	Macro 3	Macro 3	Macro 3	Macro 3	Macro 3	Macro 3	Macro 3	Macro 3
56	**M4**	Macro 4	Macro 4	Macro 4	Macro 4	Macro 4	Macro 4	Macro 4	Macro 4	Macro 4	Macro 4	Macro 4
57	**Night**	Night Mode Select	Subtitle On/Off	CDP Select				Subtitle				
58	**Skip Down**	Skip – (DVD)	Step –	Skip –		Scan –	Thumbs Down	Skip –	Skip – (DVD)	Skip – (DVD)	Skip – (DVD)	
59	**Skip Up**	Skip + (DVD)	Step +	Skip +		Scan +	Thumbs Up	Skip +	Skip + (DVD)	Skip + (DVD)	Skip + (DVD)	
60	**Dim**	Dimmer	Dimmer					Dimmer				
61	**Rewind (◄◄)**	R. Search (DVD)	R. Search	R. Search	Rewind	Rewind	R. Search	R. Search	R. Search (DVD)	R. Search (DVD)	R. Search (DVD)	R. Search
62	**Play (◄►)**	Play (DVD)	Play	Play	R. Play/F. Play	Play	Play	Play	Play (DVD)	Play (DVD)	Play (DVD)	Play
63	**FF (►►)**	F. Search (DVD)	F. Search	F. Search	Fast Fwd	Fast Fwd	F. Search	F. Search	F. Search (DVD)	F. Search (DVD)	F. Search (DVD)	F. Search
64	**Record**			Record	Record/Pause	Record	Record	Record				
65	**Stop**	Stop (DVD)	Stop	Stop	Stop	Stop	Slow	Stop	Stop (DVD)	Stop (DVD)	Stop (DVD)	Stop
66	**Pause**	Pause (DVD)	Pause	Pause		Pause	Pause	Pause	Pause (DVD)	Pause (DVD)	Pause (DVD)	Pause

Note: When any of the transport controls are pressed while the remote is in AVR, Video 2 or Video 3 mode, the remote will automatically switch to DVD mode and the command will be applied to the DVD player. If you then press a button native to the original mode, e.g., Volume Down for the AVR, the remote will revert to the original mode. See Punch-Through Programming, described in the Advanced Functions section, for more information.

Refer to Tables A11 through A17 when programming the codes for your components into the remote.

Table A11 – Remote Control Product Codes: TV

TV Manufacturer/Brand	Setup Code Number
ADMIRAL	192
ANAM	045 106 109 112 122
AOC	037 122 123 128
AUDIOVOX	012
BLAUPUNKT	084
BROKSONIC	205 206
CITIZEN	045 123 128 132
CONTEC	045
CRAIG	045 157 158 159
CROWN	045 132
CURTIS MATHES	123 128 132
DAEWOO	045 087 102 105 106 108 111 114 116 119 127 128 132
DAYTRON	128 132
DYNATECH	063
DYNEX	014
ELECTROHOME	115 132
EMERSON	045 123 128 132 139 157 158 159 162 205
FUNAI	045
FUJITSU	041 042
FUTURETECH	045
GE	029 087 121 123 128 133 145 159 163
GRUNDIG	193
HALL MARK	128
HARMAN KARDON	201
HITACHI	123 128 132 144 147
HYTEK	016
INKEL	120
JC PENNEY	115 123 128 132 145
JENSEN	019
JVC	079 087 134
KEC	045
KLH	006
KTV	045 123 132 162
LG/GOLDSTAR	101 110 122 128 132
LLOYTRON	172 173
LODGENET	069
LXI	077 145 148
MAGNAVOX	030 040 123 128 132 145 148
MARANTZ	115 123 148
MEMOREX	069 128
METZ	084
MGA	115 123 128
MITSUBISHI	077 115 123 128 160 167 168
MTC	175 176
NATIONAL	148 177 179 180 181 182
NEC	010 115 121 123 125
OLEVIA	007
OPTONICA	077
ORION	207 208 209 210 211
PANASONIC	087 148 169
PHILCO	045 115 123 128 132 148
PHILIPS	033 034 035 036 123 128 132 145 148
PIONEER	024 123 128
POLAROID	003 004 005 006 043
PORTLAND	128 132
PROSCAN	133
PROTON	008 059 122 128 132 165
QUASAR	032 087
RADIO SHACK	045 128 132 180 196 197
RCA	021 115 123 128 133 145 161 163
REALISTIC	045 167 196
RUNCO	044 046 152 153
SAMPO	059 123 128
SAMSUNG	020 022 124 128 132 145
SANYO	026 054
SCOTT	045 128 132
SEARS	128 132 145
SHARP	077 128 132
SIEMENS	084
SIGNATURE	069
SONY	028 031 117 130 136 194 212
SOUNDESIGN	045 128
SYLVANIA	025 123 128 145 148
SYMPHONIC	184
TANDY	077
TATUNG	063
TECHNICS	181
TECHWOOD	128
TEKNIKA	045 069 115 123 128 132
TELERENT	069
TERA	156
THOMSON	190 191
TIVO	051 052 and See Table A12
TMK	128
TOSHIBA	063 129 202
TOTEVISION	132
VIDEO CONCEPTS	160
VIDTECH	128
VIEWSONIC	011 038 039 047
VIZIO	011 022
WARDS	069 128 132 148
WESTINGHOUSE	017 018 023
YAMAHA	123 128
YORK	128
ZENITH	069 090

Table A12 – Remote Control Product Codes: VCR

VCR Manufacturer/Brand	Setup Code Number
AIWA	040
AKAI	048 108 109 126
APPLE TV	016
AUDIO DYNAMICS	018 048
BROKSONIC	110 147
CANON	135 140
CAPEHART	094
CITIZEN	134
CRAIG	045 116
DAEWOO	017 094 104
DAYTRON	094
DBX	018 048
DYNATECH	040
EMERSON	013 040 042 110 112
FISHER	017
FUNAI	040
GE	076 095 124
HARMAN KARDON	002 003 018 049
HITACHI	040 048
JC PENNEY	018 045
JENSEN	048
JVC	018 048 111 132
KENWOOD	020 048
LG/GOLDSTAR	018 107
LLOYD	040
LXI	020 040
MAGNAVOX	040
MARANTZ	018
MEMOREX	017 020 040 052 053 054 076 142
MGA	049
MITSUBISHI	049 131
MULTITECH	040
NAD	139
NATIONAL	140
NEC	018 048
NORDMENDE	048
OPTIMUS	159
ORION	147
PANASONIC	125 150 167 172
PHILCO	040
PHILIPS	040 075
PORTLAND	094
PULSAR	076
QUASAR	001 125
RADIO SHACK	055 134 140 142 158 159
RCA	095 124 125 157 172
REALISTIC	017 020 040 045 159
SAMSUNG	045 051 095 105 109
SANSUI	048 116 147
SANYO	017 020
SCOTT	110 112
SEARS	017 020
SHARP	129 156
SONY	080 129
SOUNDESIGN	040

Table A12 – continued

VCR Manufacturer/Brand	Setup Code Number
SYLVANIA	040
SYMPHONIC	040
TANDY	017 040
TEAC	040 048
TEKNIKA	040
THOMAS	040
TiVo	004 005 006 007 008 009 010 011 012
TMK	013
TOSHIBA	112 155
TOTEVISION	045
UNITECH	045
VECTOR RESEARCH	018
VIDEO CONCEPTS	018 040
VIDEOSONIC	045
WARDS	040 045 112
YAMAHA	018 040 048
ZENITH	040 050 076 083

Table A13 – Remote Control Product Codes: CD

CD Manufacturer/Brand	Setup Code Number
ADCOM	063 069
AIWA	072 111 118 156 170
AKAI	050 177 184
AUDIO TECHNICA	053
AUDIOACCESS	125
AUDIOFILE	211
BSR	044
CALIFORNIA AUDIO	109
CAPETRONIC	070
CARRERA	087
CARVER	136 140 141 143 144 145 185 186
CASIO	117 166
CLARINETTE	166
DENON	187 188 213
EMERSON	052 093 108
FISHER	055 095
FUNAI	126
GE	164
HAITAI	099 214
HARMAN KARDON	001 002 025 054 190
HITACHI	093
INKEL	216
JC PENNEY	098 147
JENSEN	153
JVC	176 195 196
KENWOOD	030 062 078 079 148 151 176 178 181
LG/GOLDSTAR	016 087
LOTTE	108
LUXMAN	077 102
LXI	164

Table A13 – continued

CD Manufacturer/Brand	Setup Code Number
MAGNAVOX	039 113
MARANTZ	058 084 191 192 193
MCINTOSH	194
MCS	080 098
MITSUMI	152
MODULAIRE	166
NAD	013 074 197 198
NAKAMICHI	199 200 201
NEC	069
NIKKO	053 055
ONKYO	037 038 045 046 171 175 202 203
OPTIMUS	065 089 091 092 099 104 212
PANASONIC	075 109 119 158 183 204
PHILIPS	039 138 149 209
PIONEER	071 094 100 112 123 131 161 162 215
PROTON	210
RADIO SHACK	126 166 213
RCA	024 081 093 150
REALISTIC	058 093 095 104 105 108 164 166
SANSUI	047 081 134 157 172
SANYO	033 082 095
SCOTT	108
SHARP	058 105 114 151 159 167 180 181
SHERWOOD	003 041 058 105 133
SONY	103 115 116 118 132 139 163 205 206 207 208 212 217
SOUNDSTREAM	124
SYMPHONIC	059 110
TAEKWANG	177
TEAC	011 058 085 086 106 107 110 121 137 146 154
THETA DIGITAL	039
TOSHIBA	013 074 097 151 155 173
VECTOR RESEARCH	087
VICTOR	120 130
WARDS	095
YAMAHA	019 031 053 061 135 169
YORK	166

Table A14 – Remote Control Product Codes: DVD

DVD Manufacturer/Brand	Setup Code Number
APEX DIGITAL	061
DENON	019 020 051
GE	004 103
HARMAN KARDON	001 002 003
JVC	006
LG/GOLDSTAR	005 010 055 064 066
MAGNAVOX	056
MARANTZ	059
MITSUBISHI	023

Table A14 – continued

DVD Manufacturer/Brand	Setup Code Number
NAD	062
ONKYO	009 048
PANASONIC	008 024 030 044
PHILIPS	016 056
PIONEER	018 027 041 065
PROCEED	060
PROSCAN	004 103
RCA	004 103
SAMSUNG	017 053 054
SHARP	028
SONY	011 012 015 043 045
THOMSON	004 103
TOSHIBA	009 058 067
YAMAHA	030 063
ZENITH	005 055 064

Table A15 – Remote Control Product Codes: SAT

SAT Manufacturer/Brand	Setup Code Number
BIRDVIEW	425
CHANNEL MASTER	320 321 325 361
CHAPARRAL	315 316 451
CITOH	360
DIRECTV	309 310 314
DISH NETWORK	364
DRAKE	313 317 318 413 481
DX ANTENNA	331 352 379 483
ECHOSTAR	364 395 397 452 453 463 477 478 484 485
ELECTRO HOME	392
FUJITSU	324 329 334
GENERAL INSTRUMENT	303 311 323 365 403 454 468 474
HITACHI	304 455
HOUSTON TRACKER	463
HUGHES	305 306 437 489
JANIEL	366
JERROLD	454 468 484
LEGEND	453
MACOM	317 365 369 370 371
MAGNAVOX	461 473
MEMOREX	453
MITSUBISHI	307
MOTOROLA	312 319
NEXTWAVE	423
NORSAT	373
OPTIMUS	466
PACE	328 487
PANASONIC	353 366 457 469
PANSAT	420

Table A15 – continued

SAT Manufacturer/Brand	Setup Code Number
PERSONAL CABLE	418
PHILIPS	375
PICO	407
PRESIDENT	381 404
RCA	301 358 439 458 465 490
REALISTIC	349 480
SAMSUNG	322 326 442
SATELLITE SERVICE CO	335 388
SCIENTIFIC ATLANTA	339 356
SONY	362 405
STAR CHOICE DBS	459
STARCAST	347
SUPER GUIDE	327 423
TELECOM	330 333 390 391 393 409
TOSHIBA	302 426 460 461 462 470
UNIDEN	323 332 348 349 350 351 354 355 381 383 389 403 466 479 480
ZENITH	359 384 385 387 394 419 488

Table A16 – Remote Control Product Codes: Tape

Game Manufacturer/Brand	Setup Code Number
MICROSOFT (XBOX)	001

Table A17 – Remote Control Product Codes: Cable

Cable Manufacturer/Brand	Setup Code Number
ABC	001 011
ALLEGRO	111
AMERICAST	212
ARCHER	112
BELCOR	113
CABLE STAR	033 113
CITIZEN	111
COMCAST	007
DIGI LINK	114
EAGLE	186
EASTERN	066 070
EMERSON	112
G.I.	001 011 017 096 097 210
GC ELECTRONICS	113
GEMINI	032 060
GENERAL	210
GENERAL INSTRUMENT	210
HAMLIN	056 099 100 101 117 175 208
HITACHI	001 188
JASCO	111

Table A17 – continued

Cable Manufacturer/Brand	Setup Code Number
JERROLD	001 002 011 017 073 096 097 162 188 210
LINSAY	118
MACOM	191
MAGNAVOX	017 019 068
MOVIETIME	035 039
NSC	035 190
OAK	197 220
PACE	179
PANASONIC	053 176 177 189 214
PANTHER	114
PHILIPS	013 019 020 085 090
PIONEER	001 041 119 171 209 215 216
RADIO SHACK	111 112 213
RCA	053 214
RECOTON	116
REGAL	056 099 100 101 208
REMBRANT	032
SAMSUNG	003 072 186
SCIENTIFIC ATLANTA	183 203 221 222
SEAM	121
SIGNATURE	001 188
SPRUCER	053 081 177 189
STARCOM	002 011 163
STARGATE	120
TANDY	024
TELECAPATION	028
TEXSCAN	036
TFC	122
TIVO	029 030 and See Table A12
TOCOM	170 205
UNITED CABLE	011
UNIVERSAL	033 034 039 042 113
VIDEOWAY	124 211
VIEWSTAR	019 025 053 086 089 190
ZENITH	065 125 211 219

AVR 1600 TECHNICAL SPECIFICATIONS

Audio Section

Stereo Mode, Continuous Average Power (FTC)
40 Watts per channel, 20Hz–20kHz, @ <0.07% THD, both channels driven into 8 ohms

Seven-Channel Surround Modes
Power per Individual Channel

Front L & R channels:
30 Watts per channel
@ <0.07% THD, 20Hz–20kHz into 8 ohms

Center channel:
30 Watts @ <0.07% THD, 20Hz–20kHz into 8 ohms

Surround (L & R Side, L & R Back) channels:
30 Watts per channel
@ <0.07% THD, 20Hz–20kHz into 8 ohms

Input Sensitivity/Impedance	
Linear (High-Level)	200mV/47k ohms
Signal-to-Noise Ratio (IHF-A)	100dB
Surround System Adjacent Channel Separation	
Pro Logic® I/II	40dB
Dolby® Digital (AC-3)	55dB
DTS®	55dB
Frequency Response	
@ 1W (+0dB, –3dB)	10Hz –130kHz
High Instantaneous Current Capability (HCC)	±25 Amps
Transient Intermodulation Distortion (TIM)	Unmeasurable
Slew Rate	40V/µsec

FM Tuner Section

Frequency Range	87.5–108.0MHz
Usable Sensitivity	IHF 1.3µV/13.2dBf
Signal-to-Noise Ratio	Mono/Stereo 70/68dB
Distortion	Mono/Stereo 0.2/0.3%
Stereo Separation	40dB @ 1kHz
Selectivity	±400kHz, 70dB
Image Rejection	80dB
IF Rejection	90dB

AM Tuner Section

Frequency Range	520–1720 kHz
Signal-to-Noise Ratio	45dB
Usable Sensitivity	Loop 500 µV
Distortion	1kHz, 50% Mod 0.8%
Selectivity	±10kHz, 30dB

Video Section

Television Format	NTSC
Input Level/Impedance	1Vp-p/75 ohms
Output Level/Impedance	1Vp-p/75 ohms
Video Frequency Response (Composite and S-Video)	10Hz–8MHz (–3dB)
Video Frequency Response (Component Video)	10Hz–100MHz (–3dB)
HDMI™	Version 1.3a with 10-bit Deep Color

General

Power Requirement	AC 120V/60Hz	
Power Consumption	65W idle, 540W maximum (7 channels driven)	
Dimensions	(Product)	(Shipping)
Width	17-5/16 inches (440mm)	21-7/8 inches (555mm)
Height	6-1/2 inches (165mm)	10-1/2 inches (266mm)
Depth	15 inches (382mm)	18-5/16 inches (465mm)
	(Product)	(Shipping)
Weight	20.5 lb (9.3kg)	25.3 lb (11.5kg)

Depth measurement includes knobs, buttons and terminal connections.
Height measurement includes feet and chassis.
Features, specifications and appearance are subject to change without notice.

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